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ABSTRACT

This paper argues that skill formation is a life-cycle process and develops the implications of this insight for Scottish social policy. Families are major producers of skills, and a successful policy needs to promote effective families and to supplement failing ones. We present evidence that early disadvantages produce severe later disadvantages that are hard to remedy. We also show that cognitive ability is not the only determinant of education, labor market outcomes and pathological behavior like crime. Abilities differ in their malleability over the life-cycle, with noncognitive skills being more malleable at later ages. This has important implications for the design of policy. The gaps in skills and abilities open up early, and schooling merely widens them. Additional university tuition subsidies or improvements in school quality are not warranted by Scottish evidence. Company-sponsored job training yields a higher return for the most able and so this form of investment will exacerbate the gaps it is intended to close. For the same reason, public job training is not likely to help adult workers whose skills are rendered obsolete by skill-biased technological change. Targeted early interventions, however, have proven to be very effective in compensating for the effect of neglect.

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1 Introduction

The Scottish economist Adam Smith attributed the wealth of a nation to the specialization and division of its labor force. In the first book of his magnum opus, he wrote

The difference of natural talents in different men is, in reality, much less than we are aware of; and the very different genius which appears to distinguish men of different professions, when grown up to maturity, is not upon many occasions so much the cause, as the effect of the division of labour. The difference between the most dissimilar characters, between a philosopher and a common street porter, for example, seems to arise not so much from nature, as from habit, custom, and education. When they came into the world, and for the first six or eight years of their existence, they were, perhaps, very much alike, and neither their parents nor playfellows could perceive any remarkable difference. About that age, or soon after, they come to be employed in very different occupations. The difference of talents comes then to be taken notice of, and widens by degrees, till at last the vanity of the philosopher is willing to acknowledge scarce any resemblance. But without the disposition to truck, barter, and exchange, every man must have procured to himself every necessary and conveniency of life which he wanted. All must have had the same duties to perform, and the same work to do, and there could have been no such difference of employment as could alone give occasion to any great difference of talents.

In this passage, Smith perceptively notes three basic economic forces that characterize modern economies. Individuals, who differ in talents and skills, benefit from pursuing their comparative advantage by specializing in what they do best, and through trade and cooperation. Initial differences in abilities become amplified through education and on-the-job learning; such investments make persons more productive in the tasks they pursue. Education and learning are a major source of both economic productivity and human differences.

Open markets encourage trade among diverse individuals and encourage investment in what we now call human capital. Specialization and division of labor associated with lifetime skill formation are major sources of economic growth and economic advantage.

The modern economy is based on skills. A skilled workforce is a productive one, able to adapt to change and to innovate. Inequality in skills is a major determinant of inequality in earnings. Scotland needs a more skilled workforce if it is to grow and prosper. This paper is about policies to foster skills in the Scottish workforce.

One way to foster skill is to promote immigration of skilled labor to Scotland. A more open and flexible labor market will encourage such immigration. We briefly discuss this option at the end of this essay. We do not discuss emigration. Some might argue that educating Scottish youngsters to work in London is a bad business. That ignores altruism on the part of Scottish parents or the benefits that accrue to UK and world society. Given the proper incentives, Scots will stay in Scotland. We focus most of our attention in this essay on policies to foster the skills of those born in or resident in Scotland.

Smith's observations about markets and skills apply to Scotland today. He properly emphasized the importance of acquiring skills in the workplace. Yet we have learned much more about the life cycle of skill formation than Smith knew at the time he wrote the passage that we quote. We now

know that, contrary to Smith's opinion, by age eight people are not all that similar and that basic human differences emerge much earlier and cannot all be attributed to workplace experience or even to education. A child's time spent with its family in its early years is crucial for its development. Economists and psychologists have investigated the full life cycle of learning and have come to a deeper understanding of the dynamics of the skill formation process. This new evidence changes the way we think about policies to foster skills.

The central message of an entire literature, and a main theme of this paper, is that skill policy is not the same as educational policy. Schooling is only a part of the skill formation process. What schools can achieve largely depends on the quality of the students they work with. This in turn depends on the quality of family life. An effective skill formation policy must account for the role of the family in producing skills and motivation. Dysfunctional families produce impaired children. A successful skill formation policy encompasses family policy. The current emphasis in popular discussions of skill formation policy focuses too much attention on aspects of schooling such as per pupil expenditure in schools, tuition rates and the like, and too little on the role of the family and the role of the firm. Much learning takes place on the job after schooling is completed.¹ A comprehensive skill formation policy accounts for families, schools and firms and their interactions.

The abilities and motivations of children emerge early and affect performance in schools and the work place. Bright, motivated children do better in school, are more likely to obtain higher education degrees and participate in workplace-based training. As Adam Smith noticed, initial differences among people are accentuated by educational and training choices. The downside aspect of the dynamics of skill and ability formation is that those who start with early deficits, accumulate further deficits. Remediation at later ages is costly and becomes prohibitively costly if it is attempted too late.

The motto of the new economics of skill formation is that "skill begets skill; motivation begets motivation." Skill formation is a dynamic, synergistic process and these synergies must be tapped if a successful skill formation policy is to be crafted.

The main lessons for Scotland from the modern literature are:

- Skill formation is a life cycle process. It begins in the womb and continues on in the workplace. Educational policy is only one aspect of a successful skill formation policy, and not necessarily the most important one.
- Families are major producers of skill. Dysfunctional families produce children with lower levels of ability and motivation than functioning, healthy families. A successful skills policy encompasses policies to promote successful families and to supplement failing ones. The growing proportion of out-of-wedlock births and single parent families in Scotland and the U.K. bodes ill for the future development of the Scottish workforce because such families are known to produce impaired children who perform poorly in school, the workplace and society at large.
- Skill is created through a dynamic synergistic process. Skill begets skill. Early advantages produce later advantages. Early disadvantages produce severe later disadvantages that are hard to remedy.

¹Heckman, Lochner and Taber (1998a) estimate that over 40% of post-family influence learning takes place after formal schooling ends.

- Skills are multidimensional in nature. Both cognitive and noncognitive skills are important in the workplace and in performance in schools. An emphasis on IQ or on success measured by achievement tests is misguided but conventional in policy discussions about skill formation around the world. Successful policy recognizes the multiplicity of skills and works with it.
- The heterogeneities in skills and abilities that open up at an early age produce heterogeneity in the economic returns to schooling. Rates of return to university education vary greatly among persons. The return to the marginal student is nowhere near as high as the return to the average student, although many scholars in the United Kingdom often fail to make this distinction and estimate average rates of return when discussing educational policy. They use methods which do not allow them to distinguish the marginal return from the average return. More sophisticated analyses show declining returns for marginal students. Simply put, the university is not for everyone, and skill formation policy should recognize this.
- Skills differ in their malleability over the life cycle. Contrary to the quote from Smith, IQ is more or less set by age eight and it varies greatly among persons. Noncognitive skills are malleable until later ages. This has important implications for the design of policy.
- At current levels of spending, changes in conventional educational policies that receive most of the attention in the economics of education—such as reductions in pupil-teacher ratios or increases in traditional schooling quality—are unlikely to have dramatic effects on economic or social performance. When evaluated, they do not survive a cost benefit test.
- Policies subsidizing university tuition and other schooling expenses need to be rethought. Abilities formed at early ages play a much more decisive role in accounting for disparities in college enrollment than tuition or family income facing children and their families at the age children contemplate going to college.
- There is a well established empirical regularity found in most societies that children from families with higher incomes are more likely to go to school and achieve higher education. This empirical regularity is usually interpreted to mean that “credit constraints” affect school choice and that tuition policy is the appropriate solution. The weight of the empirical evidence from many countries suggests another interpretation with vastly different policy implications. Families with higher incomes provide better *early* environments for their children. Interventions in the early years are far more likely to be effective in promoting college attendance than tuition supplements or scholarships paid at a later age. Children lacking ability and motivation do not make good college students.
- The problem of “credit constraints”—bright children denied university education because of low family income, is greatly overstated in popular discussions of educational policy in England, Scotland and the US. This alleged problem exerts disproportionate influence on policy discussions everywhere. Fewer than 8% of students are constrained in this sense in the US or the UK. Targeted subsidies for these constrained students are economically justified, but raising tuition for the others may also prove to be a prudent policy. This kind of policy will raise support for education by channeling educational funds toward students who benefit most from them and by screening out unproductive, low quality students for whom schooling is a poor investment.

- Post-school, on-the-job training (OJT) is a productive activity with a high economic rate of return. The return is higher for the most able and so this form of investment is disequalizing. It perpetuates, and even exacerbates, initial disadvantages.
- During periods of transition to new technologies or open markets, certain skills become obsolete. Workers adapted to one technology and way of doing business may be ill suited to new modes of production and trade. Retraining younger and more able workers to higher levels of skill can be a sound investment.
- Public job training programs targeted toward older displaced workers and the less able have a sorry track record. Remedial training for such people is simply not effective, so that there are better uses for those funds. Wage subsidies and policies that promote flexibility in the labor market are far more likely to promote employment than job training. Such subsidies should be cohort-specific to avoid creating a new generation of unskilled workers dependent on government for their livelihood.
- Tax policy reforms are not likely to increase human capital accumulation dramatically, although they can promote capital formation and raise wages.

This paper elaborates and documents these points. Section 2 presents some basic facts about the Scottish labor market and trends in Scottish education. Our analysis will be a comparative one, placing the situation in context with that of other developed nations. Section 3 reviews the evidence that supports the claims made in this section. Section 4 discusses interventions that have proven to be effective in the past. We draw on two papers by Heckman (2000a) and Carneiro and Heckman (2003) that present more detailed support for these arguments. We also draw on the academic literature on the UK. Section 5 concludes with policy recommendations for Scotland.

2 Comparing England, Scotland and the US

In order to design effective policies, it is necessary to have a clear understanding of the problems that the policies are intended to address. This requires getting straight the facts about Scotland. This task is not a simple one for all of the aspects of the Scottish economy because many studies neglect Scotland and do not distinguish uniquely Scottish problems. When we can break out Scottish data, we will. Otherwise, we will draw on evidence from the UK as a whole. With a few notable exceptions, the empirical patterns are very closely linked, which leads us to believe that our analysis is at least qualitatively correct and our policy recommendations are appropriate. Our comparative advantage lies in being able to offer a fresh perspective, bringing our expertise on US data to bear on Scottish issues. Those who are more familiar with the intricacies of Scottish society are better suited to tailor precise policies.

We consider several dimensions of the Scottish economy: wage premia for skilled labor, wage inequality, unemployment and worklessness, illegitimacy, crime, educational attainment and participation; and skills of the labor force. This creates a background for our discussion of skill formation policy.

Like many countries and regions in the world, Scotland had experienced a shift in demand toward more skilled labor. This has produced a premium for those who have skills as well as wage

inequality between those who have skills and those who do not. Scots have responded to the rising economic return to schooling by increasing their participation in higher education. The Scottish participation rate in higher education is increasing while among recent cohorts it is stagnating in the US and the UK.

At the same time, there are major sources of concern for Scotland. Worklessness is increasing; levels of literacy and numeracy are low and are not increasing in the younger cohorts. There is clear evidence of social pathology in the sense of more out-of-wedlock births, high crime rates and the like. Given the evidence that out of wedlock children acquire poorer lifetime skills than others, an emerging Scottish underclass should be a major source of concern addressed in any comprehensive skill formation policy.

There is also a growing group of middle age workers caught up in the dynamics of production transformation. Trained to work in obsolescent technologies, their skills are maladapted to the new economy, especially at current wage levels. Many advocate public job retraining, but the case for this activity is weak, especially for middle age and low ability workers. More creative thinking is required to devise policies to ease their transition, promote their employability and at the same time equip their children with the skills needed to work in the new economy.

2.1 Wage Inequality and Education

Educational attainment and basic literacy have become increasingly important because of the rising premium for skilled labor found in many countries. Since the late 70s, the economic return to education (the economic benefit of attending school) has risen.² Growth in overall wage inequality for both men and women is substantial.

A rise of the wage skill premium occurred in Scotland and England. Figure 1 shows that the growth of average weekly gross wages of English and Scottish workers increases with their educational level.³ The skill wage premium for those with a degree or higher is rising with respect to A levels/Highers. This is a combination of both a rise in wages for highly educated and a flat A level profile in the last 15 years. The same is true with respect to O levels/O grades. The widening wage differentials we observe in figure 1 are also apparent in the real hourly wage trends for the 10th, 50th and 90th percentiles⁴ of the UK and US wage distributions analyzed by Gosling and Lemieux (2001). They find that in both countries, women have higher rates of wage growth relative to men, and apparent wage growth is larger in the UK than the US.⁵ The 10th decile in the UK has apparently not lost ground in real terms and has actually experienced substantial wage growth, especially for women. The UK's 50th percentile has improved significantly as well. This is not the case in the US. Although the difference between the highest paid and the lowest paid worker has grown both in the UK and the US, in the US the least skilled have lost ground in real terms

²See the time-series on US returns to education in Card and DiNardo (2002).

³Scottish and English school qualifications differ. Until 1986 the Scottish equivalent of O levels were O grades. After that time, Standard Grades were awarded. Until 1999 Scottish students completed Highers and then in the following year CSYS as their certificates for post school education, a role comparable to the two year A level entry qualification in England. After 1999 these have been replaced on a phased basis by the Higher Still programme of Highers and Advanced Highers.

⁴Percentiles measure relative position in the hourly wage distribution. The 90th percentile line represents the average wages for those whose wages are greater than or equal to 90% of the people in the sample. The 10th percentile is the 10% at the very bottom. The median line represent the people from the middle—the 50th percentile.

⁵It is important to note that despite the rapid growth in their wages, women still earn less than men.

while they have not in the UK.⁶ It is clear, however, that growth in inequality took place mostly during the 1980s, and inequality remained mostly stable in the 1990s. Growth in inequality has been similar in England and Scotland, although there has been some slight divergence in the last decade (see Bell, 2004).

The primary force generating the skill premium is skill-biased technical change. As documented in Machin and Van Reenen (1997), the shift in the demand for skilled workers has operated in many sectors of the economy and is found in all countries around the world where it has been studied. Another factor contributing to the wage skill premium is the uncertainty induced by rapid technological change and the uncertainty created by open markets. As noted by Nelson and Phelps (1966) and Schultz (1975), those with more education and skill are better able to cope with, and benefit from, changes and opportunities that open up with increased trade and new technology. A more skilled workforce can create new technologies and opportunities. The modern economy is based on skills far more advanced than those used in Scotland in the mid-18th century as described by Adam Smith in *The Wealth of Nations*.

However, as noted by Smith, not everyone should be equally skilled or trained in the same fashion. Comparative advantage operates among people and among nations. For some workers, training is not an efficient investment. Scotland needs a full portfolio of skills, but it should increase its weight on skilled workers.

2.2 Employment and Worklessness

Historically, England has had slightly higher employment and slightly lower unemployment rates than Scotland for all age groups, though the trends are converging in recent years. Labor force withdrawal rates are very similar.

In the UK, worklessness is becoming increasingly more common, while the opposite is true for the US, especially for single mothers. Dickens and Ellwood (2003) summarize the effect of policy under the Blair government and compare them to the policies in the US during the same period. They argue that the British reforms focused on increasing employment of individuals who faced few benefits from entering the labor market.⁷ However, simultaneous reforms offset these employment incentives by improving out-of-work benefits.⁸ The net effect seems to have boosted employment (see Gregg and Harkness, 2003). The Clinton strategy in the US was quite different. Out-of-work benefits were cut and time limits were introduced. EITC payments to low wage workers increased. After these reforms, benefits for workers were substantially higher than for those out of work.

Dickens and Ellwood (2001) show that in England, the rise in worklessness took place over a period with stable unemployment and employment rates that have remained unchanged between

⁶The analysis of Blundell, Reed and Stoker (2003) cautions us that selective dropouts from the low end of the wage distribution bias upward these figures. Their adjusted estimates make the US and UK experiences appear to be more similar, so real wages at the bottom of the UK distribution may be declining.

⁷The Working Families Tax Credit (WFTC) raised in-work benefits for those with children, and the Childcare Tax Credit provided increased childcare support for working low income families. Moreover, the lowest income tax rate was reduced from 20 to 10%. National Insurance reforms lowered fees for those with low wages and a National Minimum Wage of £3.60 per hour was introduced for workers older than 22. Non-financial incentives included improvements in childcare provision.

⁸Benefit rates for out of work families with children were raised. Child Benefit rates, which are non-means tested and paid to every household with children, were increased. Income Support rates for low income families with children raised, while those for families without children stagnated.

1979 and 1999.⁹ However, the overall statistics obscure some important facts about worklessness. Nickell (2004) notes that unemployment among men with no qualifications has risen from 7% in 1979 to 12% in 1999, though unskilled women experienced no such change. Moreover, inactivity among working age men has risen from 4.7% to 15.9%, while inactivity among working age women has fallen from 34.6% to 26.9%. An increase in the labor force participation of married women with employed partners has disguised a decrease in participation of single women with children. The rise in inactivity among men has been among married men whose partners cease to work and among single men. Households where both partners are working and households where neither partner is working have become more common.¹⁰ This is true for Scotland as well. Bell and Jack (2002) report that from 1992 to 2001, the fraction of workless households in all working-age households rose from 17% to 22%. The fraction of households where all adults are employed rose from 54% to 57%, while the fraction where only some adults work fell from 30% to 21%.

Worklessness has increased markedly for the youngest cohorts.¹¹ Murray (2001) studies the change in employment among males ages 18 to 24 between 1989 and 1999. He shows that worklessness rose from 20.5 to 31.2, and that attrition from the labor force was highest for those between ages of 20 and 24. Faggio and Nickell (2003) show that for men inactivity was concentrated among low-skill individuals. Gregg and Wadsworth (2003) attribute the recent drop in unemployment among the low-skilled to a transition to worklessness rather than improved employment. Figures 2A-B shows that Scotland and England share this trend. Increased participation in higher education is not the reason behind this disturbing trend. It is linked to declining real wages and higher social benefits.

To put these numbers in perspective, Dickens and Ellwood (2001) estimate that in the US in 1999, less than 5% of two-parent families with children are workless. Such families without children are only marginally more likely to be without work. For single parents with children, worklessness has fallen from a peak of 44% in 1982 to about 27% in 1999 (see Dickens and Ellwood, 2001). The corresponding number for single parents without children is slightly above 20%. As noted by Nickell (2004) this cross-country difference is explained in part by generous welfare benefits in the UK. However, Dickens and Ellwood (2001) argue that the movement of people into work has not done much to decrease relative poverty. Individuals who enter the labor market increase their income, but they usually do not earn high wages. This occurs because worklessness is closely linked with education and skill, and it is concentrated among the less skilled and educated persons.

⁹Since 1998, there has been a slight decline in worklessness and a simultaneous increase in the employment rate for all of the groups in the UK as measured in the Labour Force Survey (see Shaw (2004)). The decrease in worklessness has been especially large for lone parents with children. However, the rates reported in Shaw (2003) are slightly lower in 1998 than the ones in Dickens and Ellwood (2003), who use the Family Expenditure Survey (FES), which leads us to believe some of the difference in the rates may be due to differences in the sample selection criteria, such as age and dependency.

¹⁰Between 1979 and 1999, the percentage of households where both partners are employed in all two-adult households has increased from 55% to 64%. The corresponding change in households where neither partner is working was 4 to 8%.

¹¹Looking over a longer period, Gregg and Wadsworth (2003) point out that in 1996, 19.3% of all British households had no employed adult in them. By 2002, this percentage has fallen to 16.8%. However, this is still far above the 1975 rate of about 7%. Gregg and Wadsworth (2003) exclude full-time students and households headed by people of retirement age.

2.3 Illegitimacy and Poverty

Murray (2001) shows that the illegitimacy rate—defined as the percentage of children born to unmarried mothers—increased from 5% to nearly 40% in England between 1950 and 2000.¹² Almost 80% of that increase has occurred in the last 20 years. Haskey (2001) shows that both the number of one-parent¹³ families and the number of children living in such families rose between 1984 and 2000, though both trends appear to have slowed in recent years. In 1986, one-parent families represented 14% of all families with dependent children. In 1991 the figure was 20%. By 2000, one-parent families comprised 25% of all families with dependent children and the percentage of dependent children from one-parent families was 23 percent of all dependent children. Moreover, the percentage of all families with dependent children headed by lone mothers increased at a rapid rate since 1971 (see Haskey, 2001). It is now just under 1 in 4, while in the 1970s it was 1 in 12. Kiernan (2001) reports that although lower in 1975 and 1985, the rate of out-of-wedlock births per 100 births in the UK exceeded the US rate by 1999. In Scotland, non-married households with dependent children comprise 40% of all households with dependent children.¹⁴

These changes in family structure have occurred on a short time scale, and they have far-reaching consequences for the offspring of such families. For instance, in 2001 in Scotland, only 48% of lone parent households with dependent children were employed with about half working only part-time, while 90% of couples with children have at least one partner employed.¹⁵ Employment is closely linked with poverty. Bell and Jack (2002) report that only 5% of the households where everyone worked were poor,¹⁶ and only 10% of households where at least one person worked were poor. However, 38% of households where no adults worked were in poverty. The corresponding numbers for the percentage of children in poverty were 11%, 22% and 67%. At the same time, the percentage of children living in absolute poverty in Scotland has fallen over time and the percentage of children living in relative poverty has remained stable or fallen slightly.¹⁷ This suggests that generous

¹²High illegitimacy rates are not only confined to poor neighborhoods. However, there does seem to be strong link between social class (as measured by occupation) and out-of-wedlock births. Murray (1994) reports that in 1991, the correlation between the percentage of households in Class V (unskilled workers) within local authorities and the illegitimacy rate there was 0.7.

¹³A one-parent family is defined as a mother or father living without a spouse (and not cohabiting) with his or her never-married dependent child or children aged under 16 or from 16 to under 19 and undertaking full-time education.

¹⁴We define non-married households as cohabiting couples, lone parents and other households. A dependent child is a person in a household aged 0 to 15 (whether or not in a family) or a person aged 16 to 18 who is a full-time student and in a family with parent(s). We included other households with dependent children (*i.e.*, those who report being not-married or non-cohabiting) in our calculations, though this does not change the results significantly.

¹⁵Data are from the SCROL database of the 2001 Census, available at

<http://www.scrol.gov.uk/scrol/common/home.jsp>.

A dependent child is a person in a household aged 0 to 15 (whether or not in a family) or a person aged 16 to 18 who is a full-time student in a family with parent(s). Part-time is defined as working 30 hours or less a week. Full-time is defined as working 31 or more hours a week.

¹⁶Bell and Jack (2002) define poverty as having income that is less than 60% of median household income after housing costs.

¹⁷Absolute poverty measures progress against a base year. It is defined as the percentage of children who live in households where the income from all sources is below some fraction of mean (or median) income in a fixed year, adjusted for inflation. Relative poverty uses a benchmark that changes from year to year, *i.e.*, the fraction of mean or median income from all sources in the relevant year. The most recent data on children in poverty is summarized in Department of Work and Pensions (2004).

government benefits have been responsible for offsetting some of the negative effect.

McLanahan and Sandefur (1994) observe that children from single-parent households are more likely to be poor, and have health and psychological problems. They are also more likely to engage in crime, report worse labor market outcomes and have unstable marriages. DeLeire and Kalil (2002) find that American teenagers from unmarried families are less likely to graduate high school or attend college. They are also more likely to smoke and drink at a young age. McLanahan and Sandefur (1994) confirm that various outcomes for stepchildren are similar to those of children from single-parent families. Ginther and Pollak (2004) show that even joint biological children from blended¹⁸ families have inferior outcomes relative to children reared in traditional nuclear families. In fact, educational outcomes for *all* children in blended families are very similar to the outcomes for children from single parent families. Stepchildren are also at a greater risk for abuse by step-parents and cohabiting partners (see Daly and Wilson, 1998). The problem of broken homes and out of wedlock births has serious implications for the skills and performance of the next generation.¹⁹

Many analysts dismiss this research because correlation, even with extensive statistical controls, does not establish causation. One stylized fact from this literature is that controlling for factors such as long term family income, parental education and cognitive ability greatly diminishes the effect of family structure on child outcomes (*e.g.*, Ginther and Pollak, 2004). This suggests that at least some of the disadvantages of nontraditional child-rearing can be offset by improving home environments. However, it is not clear which policies should be chosen since the current literature does not determine the causal mechanisms producing these relationships. For instance, divorce and family resources may be jointly determined and outcomes may simply reflect common unobserved factors.²⁰ There is, however, an emerging literature that uses parental death as a natural experiment. The death of a parent has a smaller negative effect on children than divorce.²¹ For instance, Cherlin *et al.* (1995) use NCDS data to compare the behavioral outcomes of British adults who experienced divorce or parental death as children with adults reared in intact families. One advantage of their study is that they control for various pre-divorce characteristics of the family and the child, such as pre-existing emotional problems, cognitive achievement and socioeconomic status. They find that by age 23, both men and women with divorced parents are more likely to leave home because of friction and to have their first child born outside of marriage. Moreover, while experiencing the death of a parent seems to exert a similar effect, it is usually much smaller. This is a consistent finding, and suggests that some portion of the benefits from marriage is not purely a matter of increased resources. Carefully tailored policy needs to bolster family structure as well as compensate for the lack thereof with educational interventions like enriched preschools, which we discuss in this essay.

¹⁸Blended families are defined as households that contain both stepchildren and their half-siblings who are the joint biological children of both parents.

¹⁹While most of the evidence we present comes from studies based on US data, it is likely that the conclusions apply to Scotland.

²⁰Perhaps single or divorced parents have personality traits that make them both poor parents and poor spouses. Another hypothesis is that difficult children drive parents apart. Most of the correlational literature is not able to distinguish these explanations.

²¹For comparisons of parental death and divorce, see Lang and Zagorsky (2001), Corak (2001) and Biblarz and Gottainer (2000).

2.4 Crime in England, Scotland and the US

In recent years, serious crime rates are higher in England²² than in the United States. This pattern is evident in both surveys of crime victims as well as the reported police statistics. Langan and Farrington (1998) analyze data from the 1995 victim surveys. They show that robbery, assault, burglary and motor vehicle theft are all higher and generally rising in England.²³ The major exception to this pattern is the murder rate, which is nearly six times higher in the US despite the large drop in the late 90s. Langan and Farrington (1998) also show that an offender's risk of being caught, convicted and sentenced to incarceration has risen in the US for all types of crime,²⁴ but has fallen in England for all but murder. Moreover, for all offenses, courts in the US hand down longer sentences and confinement is generally also longer.²⁵

Figure 3 examines the incidence and prevalence of overall victimization²⁶ in 1999.²⁷ Prevalence rates are defined as the percentage of those aged 16 or more who experienced a specific crime once or more in a given year. Incidence rates express the number of crimes experienced by each 100 people in the sample. In terms of both prevalence and incidence, England has significantly higher rates than Scotland and the US, which are not essentially different. When incidence is high relative to prevalence, we can surmise that crime is concentrated in the sense that few people experience the bulk of it. The gap is very wide in England and Wales and the US, suggesting that when people are victims they are more prone to repeated victimization. By this measure, Scotland's crime seems to be somewhat more evenly distributed.

Another alarming statistic is the estimated number of children who have parents with a serious drug problem. A recent report by the Advisory Council on the Misuse of Drugs infers that there are between 40,800 and 58,700 children in Scotland who have a parent who is a problem drug user.²⁸ This represents about 4-6% of the 1 million children under 16. However, it is true that fewer children live with a problem drug user: only about 1-2%.

Crime is also related to educational attainment, skill levels and the returns to market activities. Machin and Meghir (2000) find that falling wages of unskilled workers led to increases in crime in England and Wales between 1975 and 1996. They also find the level of criminal activity and the returns to crime are similarly closely linked, while increased deterrence is negatively linked with crime. This suggests that there are several approaches to stemming crime.

²²In our discussion of crime, data for England also includes Wales unless specified explicitly.

²³Langan and Farrington (1998) also argue that police statistics from 1996 show that assault, burglary and motor vehicle theft rates are higher in England than in the US. They also argue that the measured robbery rate would have been higher in England if the police recorded the same fraction of robberies as the US police. This problem with police statistics leads us to emphasize the results from the victimization surveys.

²⁴The six measured types of crime are murder, rape, robbery, assault, burglary, and motor vehicle theft.

²⁵It is true, however, that both the length of sentences and time served are rising in England for violent crimes.

²⁶Crimes that are included in the overall rate are car theft, theft from car, car vandalism, motorcycle theft, bicycle theft, burglary, attempted burglary, robbery, personal theft, sexual incidents and assault or threats.

²⁷This is based on Van Kesteren *et al.* (2001). This report uses data from the International Crime Victims Survey. It avoids the problem of differential reporting and definitions involved in using police data by using a common survey instrument across countries.

²⁸The lower estimate would be the correct one if both parents used drugs, while the higher estimate would be appropriate if only one parent was a drug user. The percentage is calculated using the 2000 population estimates.

2.5 Educational Attainment

How have Scottish youth responded to the new demand for skills? Here we look at educational responses because they are easily studied. Evidence for other source of skill, such as on the job learning, is less easily obtained. Figure 4 compares higher educational attainment of Scottish, English and US²⁹ cohorts born after 1940. The percentage of each cohort with at least a college³⁰ degree has increased in both Scotland and England over time, especially for those born after the late 1960s.³¹ Both the levels and their rates of growth are fairly similar in England and Scotland, with the fraction of college graduates approaching one quarter for recent cohorts. In the US, the percentage of residents with at least a degree is higher, and the acceleration in enrollment begins earlier, though it is less steep than comparable rates for Scotland and England. There appears to be a decline in attainment for those born after 1969. This pattern has not emerged in England or Scotland.

Historically the fraction of the population with low or no qualifications (see figure 5) has declined. However, this proportion has been virtually constant for some years.³² The fraction of dropouts has grown in the US, relative to older cohorts, though it is still considerably lower than in the UK.

One area of concern is the stagnation in participation (as opposed to completion) in post-compulsory education. In the US, college enrollment has stagnated for recent cohorts, even as completion is rising (see figure 6). Completion rates cannot increase indefinitely, though there is still a lot of room for it to grow since the US college dropout rate is approximately 40%. In England, both staying on rates after 16 and college participation³³ are stagnating for the youngest cohorts

²⁹The US sample contains only Whites. The UK data is separated by place of residence, and not by birth, though this does not change the results. The data is presented in 5 year moving averages. In the UK, the college category contains those who have a higher degree; NVQ level 5; first degree, or other degree qualifications. In the US, it contains those with Bachelor's, Master's, Professional or Doctoral degrees.

³⁰In the US, the distinction between colleges and universities is that latter also offer graduate programs in addition to the ordinary four-year curriculum. There are also institutions called community colleges, which do not award regular degrees. They are similar to further education colleges in the UK. In this paper, we will often refer to college in the American sense of the word, unless we indicate otherwise.

³¹Much of the jump in college attainment for those born after 1960 can be attributed to the reconstitution of the polytechnics as university institutions in 1992. This shift in supply essentially doubled the number of universities in the UK (see Lowe, 2002). Huisman *et al.* (2003) attribute the expansion in polytechnics and college sector between 1989 and 1994 to formula funding, which uses a core plus margin model. This formula means that institutions receive between 5 and 10% of their funding (the margin) as a function of how many additional students they were able to recruit at a lower price. This led the schools to expand vacancies until the marginal cost of each student equaled the average one. A similar university expansion was enabled by raising tuition fees to approximately 30% of instructional costs, and giving these fees to the university for all the additional students they attracted. Overall, enrollments in higher education was growing by more than 10% per year in the early 1990s. By 1994, this expansion was halted, though since 1998 a number of initiatives have been taken to widen and deepen participation. At the same time, however, higher education in the 90s has become less affordable as grants were replaced by loans, and a system of student fees was introduced. However, Callender and Kemp (2000) argue that the UCAS data shows no reduction in enrollment of students from lower classes.

³²In the US, however, the growth in exam certification as an alternative route to high school completion has resulted in apparent decrease in high school drop out rates. This decline is mainly illusory. Recent research indicates that exam-certified recipients are not equivalent to high school graduates (Cameron and Heckman, 1993).

³³We use the Age Participation Index (API) which measures the number of home domiciled young (aged under 21) initial entrants to full-time and sandwich undergraduate courses, expressed as a proportion of the average 18 to 19 year old population of Great Britain. Blanden and Machin (2003) argue that the increase in staying on is due to the introduction of the General Certificate of Secondary Education (GCSE) in 1988 and the consequent improvement in

(see Blanden and Machin, 2003). These trends are troubling. It is important to also note that the UK has a much lower higher education dropout rate of 18%.³⁴ This suggests that stagnation in participation is much more likely to begin exerting a downward pull on completion in the UK since the two rates are much closer together. However, until recently, the age participation index for Scotland does not seem to be stagnating,³⁵ as it is in England (see figure 7).

2.6 Literacy and Numeracy

The news on basic workforce skills is not so encouraging. Scotland, the UK and the US have a thick lower tail of barely literate and numerate persons, who are a drag on productivity and adaptability and who are a source of social problems. We use data from the International Adult Literacy Survey (IALS) to examine literacy and numeracy of adults of working age (16-65 years).³⁶ Three dimensions of literacy are used. Prose literacy is defined as the knowledge and skills required to understand and use information from texts such as newspaper articles and fictional passages. Document literacy is defined as the ability to locate and use information from timetables, graphs, charts and forms. Quantitative literacy is defined as applying arithmetic operations, either alone or sequentially, to numbers embedded in printed materials, such as calculating savings from an advertisement or the interest earned on an investment. These data allow us to compare the distributions in US, Scotland, England, Germany and Sweden. The IALS grouped the scale scores into five empirically determined levels, with Level 1 representing the lowest ability level and Level 5 representing the highest. In figures 8-10, we plot the proportion of each gender group falling in a particular level of literacy by country and the 95% confidence intervals for these estimates. Because a small proportion of people tested at the highest skill categories, we collapse levels 4 and 5 together. Relative to the US and England, Scotland has a lower proportion of people who fall in the highest levels of literacy and especially numeracy, though the difference is usually not precisely determined. Germany and Sweden perform better than the English-speaking countries.³⁷ McIntosh (2003) examines these data. Those with good to excellent literacy skills enjoy a sizeable wage premium over those who do

exam results.

³⁴This estimate comes from Smith and Naylor (2001). They estimate the US college dropout rate to be approximately 37%, which is consistent with our own estimate. It also important to note that the British system remains selective, though perhaps increasingly less so. Huisman *et al.* (2003) report that almost 23% of applicants were denied admission in 2000. The corresponding number in 1994 was 34%.

³⁵In 2000, the Scottish Government capped the number of places for domestic students and this is reflected in the flat profile in the API for Scotland in the most recent years. In contrast, the English government intends to raise the participation rates in England and Wales rise to 50% of 18-30-year-olds in either full or part-time higher education by 2010. This measure of participation is rate is currently at 44% in England.

³⁶The International Adult Literacy Survey (IALS) was conducted by 13 countries to collect information on adult literacy. In this survey, large samples of adults (ranging from 1,500 to 6,000 per country) were given the same broad test of their literacy skills between 1994 and 1996. The participating countries are Australia, Belgium (Flanders), Canada, Germany, Great Britain, Ireland, Netherlands, Northern Ireland, New Zealand, Poland, Sweden, Switzerland and the United States. More information on the IALS is available in documents located at <http://www.nald.ca/nls/ials/introduc.htm> and IALS (2002).

³⁷In terms of test scores, there is remarkable similarity in the literacy scores between the US, UK and Scotland. They are, however, considerably lower than the scores of German and Swedish workers. Moreover, these differences are not driven by illiterate immigrants. While immigrants perform worse on the three tests relative to natives, including immigrants in the analysis only raises the proportion of US females in Level 1 significantly for prose, quantitative and document literacy. The difference is not significant for any other group or level. The calculations are available upon request from the authors.

not, even accounting for their schooling attainment. Moreover, he finds that the younger cohorts do not have better skills than older ones. Younger cohorts are no better or even worse on literacy and numeracy, respectively.

In light of the encouraging performance of Scottish students on the 2000 Programme For International Student Assessment (PISA) survey of 15 year olds³⁸, it is surprising to see the literacy of the youngest Scots may not be improving. Figure 11 shows the means and the 95% confidence intervals for the overall reading score from the Progress In Reading Literacy Survey (PIRLS) for 4th graders from several OECD countries in 2001.³⁹ Scotland's students perform significantly worse than students in England and Sweden, though Scotland's performance is not significantly different from that of US or of Germany.⁴⁰

Scottish youths are going to colleges at higher rates than their parents and participation is increasing rather than stagnating as it is in England and the US. At the same time, there is a serious problem with the bottom half of the skill distribution as measured by their numeracy and literacy. The growth in worklessness and crime—linked to declining wages of the unskilled—bodes ill for the Scottish economy. Social polarization as measured by income inequality across skill groups is increasing. One way to address these problems is to invest in the skills of the young and possibly also to upgrade the skills of the adult workforce.

What would be the best way to foster the skills of the Scottish workforce? We now turn to an examination of some basic principles in the new economics of skill formation. We also present evidence on the effectiveness of various interventions.

3 Lessons on Skill Formation From Around The World

Effective policy analysis is based on empirically grounded studies of the sources of the problems that the proposed policies are intended to address. A major lesson from recent research is that the skills acquired in one stage of the life cycle affect both the endowments and the technology of learning at the next stage. Human capital is produced over the life cycle by families, schools, and firms, although most discussions of skill formation focus on schools as the major producer of abilities and skills.

A major determinant of successful schools is successful families.⁴¹ Schools work with what parents bring them. They operate more effectively if parents reinforce them by encouraging and motivating children. Job training programs, whether public or private, work with what families and schools supply them and cannot remedy twenty years of neglect. Scottish skill formation policy

³⁸In the PISA survey, Scotland has a very low fraction of students who perform at the lowest levels of reading literacy. The scale scores on reading, math and even science are also fairly high. See Education and Young People Research Unit (2002) for more details.

³⁹The PIRLS database is accessible at <http://lighthouse.air.org/timss/>.

⁴⁰There may be two sources of bias that effect the cross-country interpretation of the PIRLS scores. The average number of years spent in school by the surveyed students in Scotland was 5, as it was in England. The corresponding number for the US, Sweden and Germany was 4 years. However, on average, Scottish students were 9.8 years old at the time of the survey while American and English children were both 10.2, and German and Swedish children were 10.5 and 10.9, respectively. Thus the direction of bias is not obvious and depends on the relative effect of age and schooling on reading ability in each country.

⁴¹Coleman (1966) first established this and an entire literature summarized in Heckman (2000a) and Carneiro and Heckman (2003) supports his findings.

should be based on this basic principle.

Figure 12A summarizes the major findings of an entire literature. It plots the economic rate of return to human capital at different stages of the life cycle for a person of a given ability. The horizontal axis represents age, which is a surrogate for the agent's position in the human life cycle. The vertical axis represents the rate of return to investment assuming the same investment is made at each age. Holding everything else constant, the rate of return to a pound of investment made while a person is young is higher than the rate of return to the same pound made at a later age. Returns are higher for more able people (*i.e.*, the schedule shifts outward for the more able). Early investments are harvested over a longer horizon than those made later in the life cycle. In addition, because early investments raise the productivity (lower the costs) of later investments, human capital is synergistic. Learning begets learning; skills (both cognitive and noncognitive) acquired early on facilitate later learning. For an externally specified cost of funds (represented by the horizontal line with intercept in figure 12A), an optimal investment strategy is to invest less in the old and more in the young. Figure 12B presents the optimal investment quantity counterpart of figure 12A.

Figure 12A is also an empirical description of the economic returns to investment at current levels of spending in most economies around the world. The return to investment in the young is quite high; the return to investments in the old and less able is quite low. A socially optimal investment strategy would equate returns across all investment levels. A central conclusion of a vast body of research summarized and extended in Heckman (2000a) and Carneiro and Heckman (2003) is that at *current* investment levels in most countries, efficiency in public spending would be enhanced if human capital investment were directed more toward the young and away from older, less-skilled, and illiterate persons for whom human capital is a poor investment.

The recent literature in the economics of human development challenges a convention that equates skill with intelligence. It demonstrates the importance of both cognitive and noncognitive skills in determining socioeconomic success. Both types of skills are affected by families and schools, but they differ in their malleability over the life cycle, with noncognitive skills being more malleable than cognitive skills at later ages. Differences in levels of cognitive and noncognitive skills by family income and family background emerge very early and persist, contrary to Adam Smith's point of view as quoted in the introduction. Schooling widens these early differences, as Smith noted.

Current educational policy discussions focus on tested academic achievement as the major output of schools. Proposed systems for evaluating school performance are premised on this idea. While cognitive ability is an important factor in determining schooling and labor market outcomes, noncognitive abilities, although harder to measure, also play an important role.

Noncognitive abilities matter for success both in the labor market and in schooling. Early childhood interventions primarily improve noncognitive skills, with substantial effects on schooling and labor market outcomes, but only weakly affect cognitive ability. Mentoring programs in the early teenage years can also affect these skills. Current evaluations of skill formation policy focus too much on cognitive ability and too little on noncognitive ability.

3.1 Sources of Skill Differences

The Evidence on Credit Constraints

There is a strong relationship between family income and college attendance. Blanden and Machin (2003) show that there are substantial differences in UK college participation rates across

family income classes that have, if anything, increased in recent years. Vignoles and Galindo-Rueda (2003) present supporting evidence. Parents with higher incomes are more likely to send their children to college. This pattern is found in many other countries (see the essays in Blossfeld and Shavit, 1993). In the late 1970s or early 1980s, college participation rates started to increase in the UK, Scotland and the US in response to increasing returns to schooling. The increase is greatest for youth from the top family income groups. Such differential educational response by income class promise to perpetuate or widen income inequality across generations and among social groups.

There are two interpretations of this evidence that are not necessarily mutually exclusive. The common interpretation of the evidence, and the one that guides much current policy discussions around the world and in the UK and Scotland (Vignoles and Galindo-Rueda, 2003; Blanden and Machin, 2003), is the obvious one. Credit constraints facing families in a child's adolescent years affect the resources required to finance a college education. Poor families cannot afford to send their children to college. A second interpretation emphasizes more long-run factors associated with higher family income. It notes that family income is strongly correlated over the child's life cycle. Families with high income in a child's adolescent years are more likely to have high income throughout the child's life at home. Better family resources in a child's formative years are associated with higher quality of education and better environments that foster cognitive and noncognitive skills.

Both interpretations of the evidence are consistent with a form of borrowing constraint. The first, more common, interpretation is clearly consistent with this point of view. But the second interpretation is consistent with another type of borrowing constraint: the inability of a child to buy the parental environment and genes that form the cognitive and noncognitive abilities required for success in school and the labor market.

A vast quantitative literature surveyed and extended in Heckman (2000a) and Carneiro and Heckman (2003) suggests that the second interpretation is by far the more important one. Controlling for ability formed by the early teenage years, parental income plays only a minor role in explaining college attendance and graduation. The evidence from the US and the UK suggests that at most 8 percent of youth are subject to short-term borrowing constraints that affect their postsecondary schooling despite the enormous attention lavished on this problem in the population. Most of the family income gap in enrollment in higher education is due to long-term factors that produce the abilities needed to benefit from participation in college. Adjusting for long-term family factors (measured by ability or parental background) mostly eliminates ethnic or racial gaps in schooling in American data.

The first-order explanation for gaps in enrollment in college by family income is long-run family factors that are crystallized in ability. Short-run income constraints do play a role in creating these gaps, albeit a quantitatively minor one. There is scope for intervention to alleviate these short-term borrowing constraints. One should not expect to reduce the enrollment gaps substantially by eliminating such constraints, or fiddling with tuition rates although discussions in Scotland focus on these policies.

3.2 Family Income and Enrollment in College

Children whose parents have higher incomes have access to better-quality primary and secondary schools. Children's tastes for education and their expectations about their life chances are shaped by those of their parents. Educated parents are better able to develop scholastic aptitude in their children by assisting and directing their studies. It is known that cognitive ability is formed relatively

early in life and becomes less malleable as children age. By age 8, intelligence as measured by IQ tests seems to be fairly well set (see the evidence summarized in Heckman, 1995). Contrary to the quote from Adam Smith at the beginning of this paper, differences among people are substantial by age 8. Noncognitive skills appear to be more malleable until the late adolescent years (see Carneiro and Heckman, 2003). The influences of family factors present from birth through adolescence accumulate to produce ability and college readiness. The scope for tuition policy in promoting college attendance is restricted by the stock of adolescent ability.

The following experiment captures the essence of the distinction we are making. Suppose families participate in lotteries that are adjusted to have the same expected present value (at age zero of the child) but have different award dates. Credit markets are assumed to be imperfect so people cannot borrow against their own or their child's earnings. The timing of income receipts matters. A family that wins the lottery in the child's adolescent years is compared to a family that wins in the child's early formative years. The child from the family that wins late would lack all of the benefits of investment in the early years of the child that the child from the family that wins early would receive. The child from the late-winning family would be likely to have lower levels of cognitive and noncognitive abilities than the child from the early-winning family. A large literature supports the importance of early investment.

3.3 Adjusting Family Income Gaps using Ability or Other Long-Term Family Factors

Figure 13A, based on the analysis of Carneiro and Heckman (2002, 2003), shows that a pattern found in many countries around the world is present in England and Scotland as well. Children from higher income families are more likely to participate in higher education. In Scotland, the top quartile (*i.e.*, the top $\frac{1}{4}$ of the family income distribution) has an average enrollment rate of almost 60% *vs.* an enrollment rate of 25% for the bottom quartile. The differences in England are less dramatic but are still substantial.

The left (unadjusted) panel of figure 13B shows how the English differentials are changed when we condition on terciles (33% points) of ability as measured in a student's adolescent years. "Top" corresponds to children who are at the top third of the cognitive ability distribution. Middle is for those in the middle third and bottom is for the lowest third. Within each ability group, we classify participation rates in higher education (HE) by family income. The chart shows that ability is a major determinant of college participation. Within ability groups, children from the top income groups are more likely to go to college. Adjusting for an additional long run factor (father's education) reduces, but does not fully eliminate the family income effect (see the right hand panel of figure 13B).

Unfortunately this calculation for Scotland is less reliable because the sample is small and the standard errors of the estimates are large (see figure 13C). The big spikes shown there arise from a small number of observations. Results from the larger English sample shown in Figure 13B show a more consistent pattern, though its broad characteristics are by no means absent in the Scottish data. Ability appears to be the major determinant of participation in higher education in all countries. Adjusting for long run factors like father's schooling reduces this influence further.

Carneiro and Heckman (2003) presents a parallel analyses for US data where, if anything, the pattern found in England and Scotland is more pronounced. Ability and other long run factors

are the major determinant of college participation, not family income in the college going years. Carneiro and Heckman (2003) also show that this is true for many dimensions of college participation (completion, delay, etc.)

Deaden *et al.* (2004) replicate the Carneiro and Heckman (2003) analysis for England. They find that after controlling for ability, family background and other characteristics, individuals in the top income quartile are 7–8% more likely to stay on in post-compulsory schooling after age 16. They also find that there is little evidence of any credit constraints for higher education.

Carneiro and Heckman (2003) report further evidence on the unimportance of short-run credit constraints on college attendance. They estimate the effect on child enrollment in college of family per capita long term income and on family per capita income flows received at various stages of the life cycle (transitory income).⁴² They show that long term income matters a lot for college enrollment and transitory income flows matter little. Their evidence suggests that short-term income constraints are not binding in explaining college choices, and largely operate through delay in the receipt of college degrees.

Policies that improve the financing of the education of identified constrained subgroups will increase their human capital and may well be justified on objective cost-benefit criteria. The potential economic loss from delay in entering college can be substantial. Given standard economic values for attending college, and assuming schooling is delayed one year, the costs of the delay are 9 percent of the lifetime value of schooling in the US data (see Carneiro and Heckman, 2003). For identified constrained subgroups, the benefits to reducing delay and promoting earlier college completion, higher college quality and graduation are likely to be substantial.

In designing policies to harvest these benefits, it is important to target the interventions toward the constrained. Broad-based policies generate deadweight, although they promote a sense of equality and fairness. Dynarski (2001) and Cameron and Heckman (1999) estimate that 93 percent of President Clinton’s Hope Scholarship funds, which were directed toward high achieving children who largely came from middle-class families, were given to children who would have attended school even without the program. Undirected policies can generate similar deadweight. Such policies dissipate scarce funds and forego revenue that is better invested in productive educational ventures. We discuss tuition policy in Subsection 4.6.

While targeting those identified as constrained is good policy, it is important not to lose sight of the main factors accounting for the gaps in figure 13A. Family background factors crystallized in ability are the first-order factors explaining college attendance and completion gaps.

3.4 Early Test Score Differentials

Important differences in ability across family types appear at early ages and persist. These are found in the UK (Vignoles and Galindo-Rueda, 2003; Feinstein, 2003) and in the US (Carneiro, Heckman and Masterov, 2003), and similar patterns are found for other tests and in many other data sets. Feinstein (2003) finds that there is a 13 percentile difference in an index of cognitive development at 22 months between British children from high and low SES families. By 118 months, this differences widens to 28 percentile points.⁴³ This means that there was considerable pre-school

⁴²Long term income is formed as an average discounted income flow to the family over the life of the child at home (ages 0 to 18).

⁴³Using data from the BCS, Feinstein (2003) finds that the percentile rank on the cognitive development index at 22 months predicts educational attainment at age 26, though scores at 46 months yield better predictions. High SES

educational inequality in the UK in the 1970s. This kind of inequality is present in the US as well. Figure 14A graphs the average percentile rank on the Peabody Individual Achievement Test in Mathematics (PIAT Math) at each age by family income.⁴⁴ Ability gaps open up early and persist. This is true for many other measures of verbal and mathematical ability. The ability that drives schooling participation is shaped early in life. The available evidence indicates that cognitive ability is relatively more malleable early in the life cycle (see Heckman, 1995). Having access to more and higher-quality resources that contribute to improving cognitive ability early in life affects skill acquisition later in life.

Figure 14B presents the same average percentile ranks shown in Figure 14A, but after controlling for the long-term family factors. The gaps in rank scores across income groups are substantially reduced when one controls for mother’s education, mother’s ability, and family structure in the test score equation. Measured long-term family factors play a powerful role, but they do not fully eliminate the gaps.

Other analysts have also focused their attention on these gaps in cognitive ability and have attempted to eliminate them by controlling for more factors. Using data on the Children of the National Longitudinal Survey of Youth, Phillips *et al.* (1998) study the black-white test score gap. They analyze only math and vocabulary tests at ages 3 to 4. Like Carneiro *et al.* (2003), they cannot fully eliminate the test score gap using family background, mother’s AFQT, and rich measures of family environment, although controlling for these factors substantially reduces the gap.

The emergence of early test score differentials is not limited to cognitive measures. At early ages, differences in US children’s behaviors and attitudes across income groups are also evident, as figure 15A illustrates. The figure presents average percentile ranks in the anti-social behavior score by family income quartile.⁴⁵ It is common knowledge that motivation, trustworthiness, and other behavioral skills are important traits for success in life. The evidence summarized in Carneiro and Heckman (2003) shows that noncognitive skills matter greatly in labor markets and for success in school. Hence, understanding the gaps in these behavioral skills across different income groups (and how to eliminate them) is also important for understanding the determinants of economic success. Figure 15B presents adjusted percentile ranks of for the scores for behavioral measures for mother’s education and cognitive ability as well as family structure. Adjusting for early family background factors substantially reduces gaps in noncognitive skills across income groups. Comparing adjusted cognitive and noncognitive test scores reveals the importance of long-term factors in reducing the gaps in behavioral scores across these groups. Although noncognitive ability gaps across income quartiles cannot be eliminated at later ages, controlling for mother’s ability, educational attainment of the parents, family structure, and location significantly reduces the gaps in ranks in noncognitive abilities across these groups at both early and later ages. Vignoles and Galindo-Rueda (2003)

children with low scores are much more likely to improve their scores than low SES children with poor scores.

⁴⁴We used ranks because the absolute values of test scores or their growth have no meaning. Any monotonic transformation of a test score is also a valid test score. Use of ranks avoids this difficulty. PIAT Math measures a child’s attainment in mathematics as taught in mainstream education. The tests consists of 84 multiple choice questions of increasing difficulty, beginning with recognizing numerals and progressing to geometry and trigonometry.

⁴⁵Mothers were asked 28 age-specific questions about frequency, range and type of specific behavior problems that children age four and over may have exhibited in the previous three months. Factor analysis was used to determine six clusters of questions, one of which is Anti-social behavior. The responses for each cluster were then dichotomized and summed. Anti-social behavior consists of measures of cheating and telling lies, bullying and cruelty to others, not feeling sorry for misbehaving, breaking things deliberately (if age less than 12), disobedience at school (if age greater than 5), and trouble getting along with teachers (if age greater than 5).

present similar evidence for the UK.

Good families promote cognitive, social, and behavioral skills. Bad families do not. Children from broken homes or single parent families suffer both cognitive and noncognitive deficits. The relevant policy issue is to determine what interventions in bad families are successful.

3.5 The Evidence on the Importance of Noncognitive Skills

Much of the neglect of noncognitive skills in analyses of earnings, schooling, and other life outcomes is due to the lack of any reliable method for measuring them. Many different personality and motivational traits are lumped into the category of noncognitive skills. Psychologists have developed batteries of tests to measure these skills (see, *e.g.*, Sternberg, 1985). Companies use these tests to screen workers, but they are not yet used to ascertain college readiness or to evaluate the effectiveness of schools or reforms of schools. The literature on cognitive tests ascertains that one dominant factor (“*g*”) summarizes cognitive tests and their effects on outcomes. No single factor has emerged as dominant in the literature on noncognitive skills and it is unlikely that one will ever be found, given the diversity of traits subsumed under the category of noncognitive skills.

Studies by Bowles and Gintis (1976), Edwards (1976), and Klein *et al.* (1991) demonstrate that job stability and dependability are traits most valued by employers as ascertained by supervisor ratings and questions of employers, although they present no direct evidence on wages and educational attainment. Perseverance, dependability and consistency are the most important predictors of grades in school (Bowles and Gintis, 1976).

Heckman and Rubinstein (2001) present the cleanest evidence on this point using evidence from the General Education Degree (GED) testing program in the United States. The GED program is a second-chance program that administers a battery of cognitive tests to self-selected high school dropouts to determine whether or not their level of academic attainment is equivalent to that of high school graduates. If they pass the test, GED recipients are eligible to apply to college.

The GED examination is successful in psychometrically equating GED test takers with ordinary high school graduates who do not go on to college. Recipients are as smart as ordinary high school graduates who do not go on to college. GED recipients are also smarter than other high school dropouts who do not obtain a GED, and they earn more than other high school dropouts, have higher hourly wages, and finish more years of high school before they drop out. This is entirely consistent with the literature that emphasizes the importance of cognitive skills in determining labor market outcomes.

When measured ability is controlled for, however, GED recipients earn less, have lower hourly wages, and obtain lower levels of schooling than other high school dropouts. Some unmeasured factors therefore account for their relatively poor performance compared to other dropouts. Heckman and Rubinstein (2001) identify these factors as noncognitive skills noting that a subsequent analysis should parcel out which specific noncognitive skills are the most important.

The fact that someone has received the GED sends a mixed signal. Dropouts who pass the GED test are smarter (have higher cognitive skills) than other high school dropouts and yet at the same time have lower levels of noncognitive skills. Both types of skill are valued in the market and both affect schooling choices. The findings of Heckman and Rubinstein (2001) challenge the conventional signaling literature, which assumes there is a single skill that determines socioeconomic success. It also demonstrates the folly of a psychometrically-oriented educational evaluation policy that assumes that cognitive skills are all that matter for success in life.

While IQ is fairly well set by age 8, motivation and self-discipline are more malleable at later ages (Heckman, 2000a). Given the evidence on the quantitative importance of noncognitive traits, social policy in Scotland should be more active in attempting to alter noncognitive traits, especially in children from disadvantaged environments who receive poor discipline and little encouragement at home. This more active social-policy approach would include mentoring programs and stricter enforcement of discipline in the schools. We present evidence on the value of such interventions in the section 4. Such interventions would benefit the child and the larger society but at the same time might conflict with widely held values of sanctity of the family for those families that do not value self-discipline and motivation and resent the imposition of what are perceived as middle-class values on their children.

3.6 Summary

Long-term environmental factors crystallized in cognitive and noncognitive abilities play a major role in accounting for gaps in schooling attainment across socioeconomic groups. Short-term borrowing constraints and tuition factors that receive prominent attention in current policy discussions do not. Short-term credit constraints do, however, affect a small group of persons, and targeted-subsidy policies appear to be cost effective for those persons. One cannot expect tuition reduction policies to eliminate the substantial gaps in schooling attainment according to socioeconomic background. Gaps in levels of cognitive and noncognitive skills open up early and are linked to family environments at early ages, not parental income in the adolescent years. Noncognitive skills substantially determine socioeconomic success later in life.

In the next part of this essay, we apply these lessons and add to them in our analyses of specific policies designed to foster skills in the Scottish population.

4 Analyses of Specific Policies

This part of the paper turns to the analysis of specific policies. We analyze the returns to schooling and schooling quality and the returns to job training, early childhood interventions, and mentoring programs. We also consider tax and subsidy policy, and problems associated with the transition to new technologies that demand new skills and make old skills obsolete. We draw on studies from the US and the UK.

We do not discuss subsidies justified by human capital externalities. Although such externalities have played a prominent role in the recent revival of growth theory by leading economic theorists, no evidence for them at the current level of spending in modern societies has been found. An accumulating body of evidence (*e.g.*, Acemoglu and Angrist, 2001; Heckman, Layne-Farrar, and Todd, 1996; Heckman and Klenow, 1998) suggests that these theoretical possibilities are empirically irrelevant. Human capital “spillovers” that are not internalized in functioning markets are not to be found in the data.

We now turn to some evidence on the efficacy of various traditional and nontraditional policies.

4.1 The Returns to Schooling

Few topics in empirical economics have received more attention than the economic return to schooling. By now there is a firmly established consensus that the mean return to a year of schooling, as of the 1990s, exceeds 10 percent and may be as high as 17 to 20 percent (Carneiro, Heckman and Vytlačil, 2001). An extra year of college can raise earning by as much as 17%. This return is higher for more able people (Taber, 2001) and for children from better backgrounds (Altonji and Dunn, 1996). Those from better backgrounds and with higher ability are also more likely to attend college and earn a higher rate of return from it. The synergy or complementarity suggested in figure 12A is confirmed in estimates of ability and background on earnings. Both cognitive and noncognitive skills raise earnings through promoting schooling and through their direct effects on earnings. (See the evidence in Taber, 2001; Heckman, Hsee, and Rubinstein, 2001; Carneiro, Hansen, and Heckman 2001, 2003.) Table 1 presents a summary of the mean rate of return to schooling for different ability groups. The annual return to college is substantially higher for persons with greater ability. Those at the top 95% of the ability distribution have rates of return almost twice those at the bottom 5%. Students at the margin of attending college or not attending have substantially lower returns at each ability level than those who attend college (compare line 4 with line 2.)

The research of Carneiro, Hansen and Heckman (2001, 2003) and Cunha, Heckman and Navarro (2004) shows that returns to schooling are lower for people who are less likely to attend college. Carneiro, Hansen and Heckman (2003) compare the marginal returns for people at various levels of the probability of attending college. Marginal students earn less than average students. The message of this figure and of Table 1 is that college is not for everyone, because in general, ability greatly affects rates of return. Meghir and Palme (2003) find that in Sweden the returns to compulsory schooling are highest for those with above-median ability. In fact most of the overall increase in earning for their sample was driven by the high-ability subgroup from poor backgrounds. This body of evidence suggests that early ability differences affect returns on later investments.

4.2 Raising Schooling Quality

The most commonly suggested reforms for schools are class size reductions, institution of summer school programs, and increases in teacher salaries and per-student expenditures. Krueger (1999, 2003) suggests that these interventions are likely to be cost effective, although the benefit cost ratios he presents are very low and typical of what is found in the literature. Some of the evidence on the success of such initiatives is based on experimental evidence, such as that from the Tennessee Student-Teacher Achievement Ratio (STAR) program which has been widely publicized. Evidence from this program has been mixed; kindergarten students in smaller classes initially have higher test scores than those in larger classes, but in later grades, treatment and control group students' test scores move much closer together, although there is still a small positive effect of the program (see Hanushek 2000; for an opposing view, see Krueger 1999). There is no evidence that class size reductions of the sort reported in the Tennessee STAR experiment will substantially affect earnings or reduce the substantial skill gaps across socioeconomic groups. Even if the test score gains from class size reduction can be shown to be persistent, test scores are only weakly linked to earnings later in life (Cawley, Heckman, and Vytlačil 1999; Heckman and Vytlačil, 2001).

Studies linking measures of schooling quality to lifetime earnings and occupational achievement have recently appeared, making unnecessary reliance on inherently arbitrarily scaled test scores

for evaluating the effectiveness of interventions in schooling quality. There is a growing consensus based on these studies that within current ranges of funding in most developed economies, changes in measured inputs such as class size and spending per pupil have weak effects on the future earnings of students (see Heckman, Layne-Farrar, and Todd 1996; Hanushek 1998, 2002).

Even if one takes the most favorable estimates from the literature and combines them with the best-case scenario for the costs of raising schooling quality, decreasing the pupil-teacher ratio by 5 pupils per teacher does not turn out to be a wise investment. Such a reduction in the pupil-teacher ratio, while keeping the number of students enrolled the same, would require the addition of new teachers, not to mention the addition of new classroom and school facilities. Accounting only for the costs of adding new teachers, Carneiro and Heckman (2003) estimate that decreasing the pupil-teacher ratio by 5 pupils per teacher would cost about \$790 per student.⁴⁶ They present estimates of the net returns for such a reduction in pupil-teacher ratio based on US data under different assumptions about productivity growth, discount rates, and the social opportunity costs of funds. Taking a high estimate (relative to the estimates reported in the literature) of a 4 percent increase in future earnings resulting from a decrease in the pupil-teacher ratio by 5 pupils per teacher yields a negative present value of between \$2,600 and \$5,500 per 1990 high school graduate at standard discount rates (5 to 7 percent). Dearden *et al.* (2002) report what an entire literature finds: in developed countries, returns to improvements in schooling quality are miniscule or nonexistent, and rarely survive a cost-benefit test.⁴⁷ Bell and Sarajev (2004) report that despite spending nearly 25% more per capita on education in Scotland relative to England, this difference is not apparent in higher wages for full-time Scottish employees, conditional on individual and labor market factors.

The evidence presented here regarding the returns to reductions in pupil-teacher ratios indicates that the United States, the United Kingdom and Scotland may be spending too much on students given the current organization of educational production. Pouring more funds into schools to lower class sizes by one or two pupils or to raise spending per pupil by a few hundred pounds will not solve the problems of the Scottish primary and secondary school system, nor will it substantially stimulate the college going of the poor.

The literature in economics does not say that school quality does not matter. Hanushek (1971, 1997), Murnane (1975), and Hanushek and Luque (2000, 2003) all show that individual teachers matter in the sense of raising the test scores of students.⁴⁸ Conventional measures of teacher quality do not, however, predict who are the good teachers. Giving principals more discretion in rewarding and punishing teachers would be a more effective way to use local knowledge than increasing measures of dubious predictive value. Bureaucratization of public schools hinders use of this knowledge.

⁴⁶All dollar values presented here are in 1990 dollars. This amount is roughly equivalent to £630 today.

⁴⁷Dearden *et al.* (2002) find that the primary pupil-teacher ratio has no effect once they condition on math and verbal ability. Using similar controls, the secondary ratio has no effect on educational attainment, though there are small effect on wage at age 33 (though not 23), particularly for women. Measures of school quality are not found to have any effect on the probability of employment, conditional on qualifications. Dustmann *et al.* (2003) find large effect of class size on the decision to stay on after 16, but no direct effect of class size on wages independent of the decision to stay in school.

⁴⁸Machin and McNally (2003) find large gains in reading and English for 11-year-old students who were exposed to the Literacy Hour program between 1996 and 1998. At this age the effect is about 2-2.5 percentile points for reading and about 3 % more kids achieving Level 4 or above in English. There are also some weak improvements in GSCE performance at age 16. Unlike most interventions in school quality, the Literacy Hour focused on curricular content and class management and not on lowering the pupil teacher ratio.

Although the effects of schooling quality vary across environments and additional funding for some schools may be justified in certain cases, marginal improvements in school quality are unlikely to be effective in raising lifetime earnings and more fundamental changes are required if one hopes to see a significant improvement in our educational system.

4.3 Improving School Quality Through Choice and Competition in Schooling

Currently in Scotland, there is very little choice in schools and the incentives for excellent performance by teachers and pupils are muted. School choice has been advocated as a reform to improve the quality of educational services for students. Proponents of school choice argue that competition among schools to attract students will force schools to decrease costs and increase the quality of services provided. Additionally, by having parents actively choose the schools attended by their children, school choice systems would likely increase the degree of parental involvement in children's schooling. On the other hand, opponents of school choice argue that increased competition among schools will lead to increased stratification and inequality among students as well as a dilution of basic schooling standards and that poor parents lack the information and the ability to make informed decisions for their children. Hence, school choice systems would be most beneficial to those already able to exercise choice in the current system, the richer families.

Voucher experiments provide data for empirical studies concerning school choice. Experiments that give tuition vouchers to public-school students so that they may attend private schools have been conducted in several US cities, including Milwaukee, Cleveland, Minneapolis, and New York.⁴⁹ These experiments have been studied but the conclusions of these studies have been controversial. Researchers do not agree on whether vouchers have any impact on students' educational achievement. Recent research (see Peterson and Hassel, 1998) shows important differences in parental satisfaction. Relative to parents not allowed to exercise choice, parents under school choice systems are more likely than other parents to report satisfaction with their children's school. These voucher experiments are often limited in their scale, and it is difficult to generalize any findings from them to the national level. Any national voucher program will most likely have large general-equilibrium effects that cannot be estimated from these small-scale experiments (see Urquiola and Hsieh, 2002).

Other researchers have studied the effect of introducing competition among public schools into the monopolistic setting of the US public school system. Evidence from these studies indicates that increased school competition and student and parental choice improves the quality of schools, as measured by test scores and by parental and student satisfaction with learning. Contrary to the view that competition siphons resources away from the public sector to its detriment, Hoxby's (2000) research suggests that when public schools are subject to greater competition both from parochial and other private schools, the performance of all schools increases. Higher levels of achievement are produced at lower cost. Making schools more competitive in salaries and rewarding excellent performance by students as well as teachers will promote productivity.

A study by Neal (1997) demonstrates that the higher schooling attainment of students in Catholic schools compared to those in public schools in the US is largely a consequence of gains registered by inner-city students who choose Catholic schools over inferior inner-city public schools. In American suburban schools, where districts are smaller and competition among school districts

⁴⁹Prominent studies include Witte (2000), Peterson and Hassel (1998) and Rouse (1997).

is more intense, the Catholic schools have little advantage over the public schools, and the performance of both school systems is higher than in the inner-city schools. Grogger and Neal (2000) present substantial evidence confirmatory of the original Neal study using a broader set of outcome measures, including measured achievement and attainment.

The conventional argument of educational planners against choice in schools is that parents and students are not able to make wise choices. The available evidence points to better outcomes from increased school competition but it is far from definitive. Policies that promote such competition are much more likely to raise schooling performance than policies that increase schooling quality and do not change the organization of schools. Exact quantitative trade-offs, however, are not available (see Hanushek 2000, 2002).

4.4 Early Childhood Investments

The evidence summarized in section 3 shows that both cognitive and noncognitive abilities affect schooling and economic success and that socioeconomic differences in cognitive and noncognitive skills appear early and, if anything, widen over the life cycle of the child. Parental inputs are important correlates of these skills. Yet the policy interventions supported by this evidence is far from obvious, because the exact causal mechanisms through which good families produce good children are not yet well understood. Perhaps for this reason, most societies have been reluctant to intervene in family life, especially in the early years.

There is a profound asymmetry in popular views about family life and schooling. On the one hand, there is a widespread belief that parents cannot make wise choices about their children's schooling. If that is true, then how can parents be trusted to make correct decisions in the preschool years, which recent research has demonstrated to be so important for lifetime success? The logical extension of the paternalistic argument that denies the wisdom of parental sovereignty in choosing schools would suggest that the state should play a far more active role in the preschool life of the child. That is a position that few would accept.

Paternalistic interventions in the early life of children in dysfunctional families may be appropriate. If one is to violate the principle of family sovereignty anywhere in the life cycle process of learning, the case for doing so is strongest at the preschool stage (and only for some groups) and not at later stages of formal schooling, for which the argument for paternalism is most often made. Dysfunctional families and environments are major sources of social problems and, as established in section 2, the proportion of children growing up in dysfunctional families in Scotland and the UK is increasing. Paternalistic interventions into the life of such families are warranted on efficiency grounds, although such interventions raise serious questions about the need to protect the sanctity of family life.

Although there are several early interventions in the UK, such as Sure Start and Effective Provision of Pre-School Education (EPPE), we do not know of any extensive evaluations of their long term effects. However, if US evidence is any indication of their potential, they should prove to be fairly successful. Recent small-scale studies of early childhood investments in children from dysfunctional families and disadvantaged environments have shown remarkable success and indicate that interventions in the early years can effectively promote learning. They demonstrate the value of good families by showing that interventions that good families routinely provide can remedy the failings of bad families. Early childhood interventions of high quality have lasting effects on learning and motivation. They raise achievement and noncognitive skills, but they do not raise

IQ. Disadvantaged subnormal IQ children (average IQ = 80) in Ypsilanti, Michigan, were randomly assigned to the Perry Preschool program, and intensive treatment was administered to them at ages 4 to 5. The treatment consisted of a daily $2\frac{1}{2}$ hour classroom session on weekday mornings and a weekly ninety minute home visit by the teacher on weekday afternoons to involve the mother in the educational process. The length of each preschool year was 30 weeks, beginning in mid-October and ending in May. The average child-teacher ratio for the duration of the program was 5.7. Treatment was then discontinued, and the children were followed over their life cycle.

Evidence on the treatment group, which is now about thirty-five years old, indicates that those enrolled in the program have higher earnings and lower levels of criminal behavior in their late twenties than did comparable children randomized out of the program. Reported benefit-cost ratios for the program are substantial. Measured through age 27, the program returns \$5.70 for every dollar spent. When returns are projected for the remainder of the lives of program participants, the return on the dollar rises to \$8.70 (see table 2). A substantial fraction (65 percent) of the return to the program has been attributed to reductions in crime (Schweinhart, Barnes, and Weikart, 1993).

The Syracuse Preschool program provided family development support for disadvantaged children, from prenatal care for their mothers through age 5 of the children's lives. Reductions in problems with probation and criminal offenses ten years later were as large as 70 percent among children randomly assigned to the program. Girls who participated in the program also showed greater school achievement (Lally, Mangione, and Honig, 1988). Studies have found short-term increases in test scores, less in-grade retention, and higher high school graduation rates among children enrolled in early intervention programs. Of those studies that examine delinquent or criminal behavior, most have found lower rates of such behavior among program participants.

Recent estimates of the rate of return to the Perry preschool program are 13 percent (Barnett, personal communication, 2002). This number looks low relative to the 15 to 20 percent return for schooling reported by Carneiro and Heckman (2003). However, it should be compared to the return for low-ability students, because the Perry program only recruited low-ability children. Recall that Table 1 shows that the return to one year of college for the average individual in the fifth percentile of the ability distribution is 11 percent and the return to college for the average individual in the fifth percentile of the ability distribution not attending college is only 7 percent. (Most of the population at this percentile of the ability distribution is not attending college, so the latter is the relevant number for the comparison.) For individuals at the twenty-fifth percentile of the ability distribution, higher than the percentile rank for the Perry participants, this return rises to 9.5 percent. The returns to maternal inputs at early ages are very high for normal children. 13 percent is a lower bound on the return for normal children. The return to the Perry program is very high.

Evidence on the more universal Head Start program is less clear, but the program is quite heterogeneous and is much less well funded than the Perry Preschool program. Currie and Thomas (1995) find short-term gains in test scores for all children participating in Head Start; most of those gains decayed quickly, however, for African American children after they left the program. Currie and Thomas conclude that either differences in local-program administration or in quality of schooling subsequent to the Head Start program are at the root of the differences between the outcomes for black and white children. Ramey *et al.* (1988) note that the schools attended by the Perry Preschool children were of substantially higher quality than those attended by the typical Head Start child. In addition, the Perry program also taught parenting skills and arguably put better long-term environments in place for the children. The failure in subsequent years to support the initial positive stimulus of Head Start may account for the decline in the impact of Head

Start over time, and may account for its apparent ineffectiveness compared to the Perry Preschool program. In a more recent paper, Garces *et al.* (2002) find substantial long term effects of Head Start on high school graduation, college attendance, earnings and crime. The largest effects are for individuals whose mothers have less than a high school education. Among whites in this group, attending Head Start leads to a 28 percent increase in the probability of high school graduation, a 27 percent increase in the probability of college attendance and a 100 percent increase in earnings measured in the early twenties. For blacks, the likelihood of being booked or charged with crime is 12 percent lower for those who attended Head Start than for those who did not.⁵⁰

As noted in section 3, an emphasis on cognitive test scores is misplaced. It appears that early childhood programs are most effective in changing noncognitive skills, although they also raise achievement test scores (as opposed to IQ). We also note that eventual decay of initial gains in test scores, like those found in regard to the Head Start program, were found for programs like Perry Preschool as well, but the long-term evaluations of these programs are quite favorable in terms of participants' success in school and society at large.

The fade-out effects in test scores found for the Head Start program do not imply that participation in the program has no long-term beneficial effects. Head Start may improve the lifetime prospects of its participants, despite yielding only short-term gains in test scores, which may not measure many relevant dimensions of social and emotional skills.

The Perry intervention affected both children and parents. Parents in the program improved their education and labor force activity and reduced their participation in welfare. Successful enrichment programs like Perry Preschool foster long-term improvements in the home environment that carry over to the child long after the program has terminated. Head Start offers a much lower quality staff who are also paid accordingly, part-time classes for children, and limited parental involvement. The program terminates without any substantial intervention into or improvement in the home environments of the disadvantaged children. Improvements in Head Start, proponents argue, are likely to produce effects closer to those observed in more-successful small-scale programs. Given the potential for success of such programs (as exhibited by the Perry Preschool experiment), more studies of the long-term impacts of various types of small-scale and broad-based early intervention programs are warranted. Calculations by Donohue and Siegelman (1998) indicate that if enriched early intervention programs were targeted toward high-risk, disadvantaged minority male youth in the US, the expected savings in incarceration costs alone would more than repay the substantial costs of these enriched programs.

An important lesson to draw from the Perry Preschool program, and indeed from the entire literature on successful early interventions,⁵¹ is that the social skills and motivation of the child are more easily altered than IQ. There also tends to be a substantial improvement in the children's social attachment. The social and emotional skills acquired in these types of programs affect performance in school and in the workplace. Academics have a bias toward believing that cognitive skills are of fundamental importance to success in life. Because of this, the relatively low malleability of IQs after early ages has led many to proclaim a variety of interventions to be ineffective. Yet the evidence from the Perry Preschool program and the evidence summarized in Carneiro and Heckman (2003) reveals that early intervention programs are highly effective in reducing criminal activity, promoting

⁵⁰There is also new evidence that suggests that Head Start may not have any effect. Imai (2004) uses a difference-in-differences approach rather than the family fixed effects method. He finds no effect whatsoever on cognitive outcomes or problem behavior.

⁵¹See Carneiro and Heckman (2003) for a review.

social skills, and integrating disadvantaged children into mainstream society. The greatest benefits of these programs are their effects on socialization and not those on IQ. Social skills and motivation have large payoffs in the labor market, so these programs have the potential for a large payoff. These programs may be very effective as antidotes to the adverse family environments arising from the growth of dysfunctional families. Enriching the educational and nurturing content of the recently expanded early child care system will pay off in producing a more skilled and emotionally competent workforce.

We next turn to the evidence on the effectiveness of interventions for older children. Programs aimed at intervening in the lives of children in their teen years attempt to redress the damage of bad childhoods. Although these programs do not raise participants' IQ, there is some evidence that they can affect their social skills (nongognitive abilities), because the prefrontal cortex, which controls emotion and behavior, is malleable until the late teenage years (Shonkoff and Phillips, 2000).

4.5 Interventions in the Adolescent Years

How effective are interventions in the adolescent years? Is it possible to remedy the consequences of neglect in the early years? These questions are relevant because cognitive abilities are fairly well determined and stable by age 8 in the sense that IQ at later ages is highly correlated with IQ at those ages. Just as early intervention programs have a high payoff primarily because of the social skills and motivation they impart to the child and the improved home environment they produce, so do interventions that operate during the adolescent years, and for the same reasons.

Carneiro and Heckman (2003) summarizes evidence on the effects of adolescent interventions on education, earnings, and crime rates. The available schooling literature demonstrates that providing disadvantaged students with financial incentives to stay in school and participate in learning activities can increase schooling and improve employment outcomes. It should be noted that although programs providing such incentives have proven to influence employment and earnings positively, and often to reduce crime, they do not perform miracles. The impacts they achieve are modest, but positive.

The evidence on programs aimed at increasing the skills and earnings of disadvantaged youth suggests that sustained interventions targeted at adolescents still enrolled in school can positively affect learning and subsequent employment and earnings.⁵² Interventions for dropouts are much less successful. It is important to remember, that the interventions conducted by such programs only partially alleviate and do not reverse early damage caused by poor family environments.

4.6 Tuition Policy

Tuition policy is hotly debated in Scotland and elsewhere. The recent prohibition on student contributions in Scotland and the authorization of optional variable fees in England exemplify the sensitivity of this issue. Although in both countries these decisions were accompanied by additional measures intended to aid students from disadvantaged backgrounds, most of the past beneficiaries of such programs have been students from relatively wealthy backgrounds.⁵³ The middle class

⁵²See U.S. Department of Labor (1995) for a more comprehensive survey of programs aimed at increasing the skills and earnings of disadvantaged youth.

⁵³Moreover, the additional funds available in England may impair Scotland's ability to attract and retain staff, professors and students.

has a strong political interest in getting the rest of society to pay the college bills for its children (Peltzman, 1973), and yet free—or heavily subsidized—tuition is viewed as an egalitarian policy, opening opportunities for education to the poor.

Recent analyses challenge this widely held premise. The studies of Cameron and Heckman (2001) and Keane and Wolpin (2001) show that variation in tuition plays only a minor role in accounting for schooling attendance gaps by family income status. Far more important are the abilities determined at early ages. One promotes college attendance by shaping these abilities.

One might argue that in a period of stringent public funds, charging tuition and raising standards may be a better policy than subsidizing tuition for everyone. The increased tuition can help meet the costs of college (and other educational expenditures) and ration places to those with a greater demand for schooling. Merit (ability) based scholarships targeted to bright but poor children (*e.g.*, the bottom income quartile of the top ability group in the right half of figure 13B) can make sure that deserving students go to school.

Our evidence that the returns to college are lower for marginal and low-ability students shows that college is not for everyone. The absence of any clear evidence of substantial human capital externalities at current levels of funding suggests that there is considerable scope for raising fees and charging people for the benefits they will achieve, that largely accrue to themselves. Under the guise of equality of opportunity, current public policy in Scotland subsidizes those from more advantaged environments rather than going to the root of family problems that cause disadvantages in skills and motivation that appear early and persist throughout life unless treated early.

4.7 Public and Private Job Training

Because of a lack of data, the returns to private-sector training are less well studied than the returns to public-sector training. Studies by Lynch (1992, 1993), Lillard and Tan (1986), Bishop (1994), and Bartel (1992) find sizable effects of private-sector training on earnings. In comparison with studies of public-sector training, most of these studies do not attempt to control for the bias that arises because more able persons are more likely to undertake training, so estimated rates of return overstate the true returns to training by combining them with the return to ability. Part of the measured return may result from the fact that more motivated and able persons undertake training. Upper-bound estimates of the return to training for marginal entrants range from 16 to 26 percent and are comparable to those obtained from education (see Mincer, 1993).

Somewhat smaller returns are found in data for the UK. These studies typically use econometric methods to control for ability and this accounts for the lower estimated returns than those found in the American studies which do not control for ability. Blundell *et al.* (1999) estimate that employer provided training (EPT) that leads to a qualification results in 7.8% return for the male worker. EPT that does not involve formal qualification leads to a return of 8.3%. Non-employer provided training has zero effect. Male workers who experience five or more training courses during the time of the study earn 12.5% more.⁵⁴ There is also some evidence that EPT with qualifications is not firm-specific, so that workers who change employers will still gain from the experience. EPT provides sizeable gains, especially considering that 13% of the Scottish working-age population participated in training in 2000.⁵⁵

⁵⁴The corresponding effects for female workers are 10%, 14%, 0% and 7.8%.

⁵⁵This percentage is calculated from the Scottish Household Survey, 2000. Working age includes those between 16

As noted in section 3, an important feature of private sector training is that the more-skilled and more-able participants in such training do more investing in human capital even after they attain high skill levels. Different types of training and learning have strong complementarities with respect to one another. The hypothesis of universal complementarity that underlies figures 12A and 12B receives support in recent US data. More able people and people with more schooling are more likely to participate in company training. Those with higher parental income, however, after their own education and their own ability are controlled for, are more likely to train in companies after completing their schooling. Blundell *et al.* (1999) find that those with more education (including previous training) and higher cognitive ability are much more likely to participate in training. The same patterns are found in the US (see Carneiro and Heckman, 2003).

Low-skilled and low ability persons typically do not participate in private-sector training. Firms can be exclusive regarding participation in programs they fund in ways that government training programs for disadvantaged workers are designed not to be. The lack of interest of private firms in training disadvantaged workers indicates the difficulty of the task and the likely low return to this activity. The best available evidence indicates that public training programs are an inefficient transfer mechanism and an inefficient investment policy for low-skilled adult workers. We turn to that evidence next.

4.7.1 Evidence about Conventional Public Training and Work-Welfare Programs

Before we turn to a discussion of the benefits of specific training programs, it is important to reiterate a few general points that critically affect how we interpret the evidence on public sector training. In evaluating any public project, it is necessary to account for the welfare costs of raising public funds as well as the direct costs of providing the services.⁵⁶

In accounting for human capital projects (or any other type of investment project), it is necessary to estimate accurately the time series of the returns and to discount it appropriately to compare with project costs. Heckman and Smith (1998) show the importance of applying these principles. They take experimental estimates from the evaluation of a major US job training program and makes alternative assumptions about benefit duration, costs, welfare costs, interest rates for discounting, and the welfare cost of public funds. Accounting for these factors vitally affects the estimates of the economic return to training. Especially important is the assumption about benefit duration. The JTPA evaluation followed participants for only thirty months. When the benefits of the training provided are assumed to persist for seven years, the estimated effects are larger in absolute value.⁵⁷ Conventional evidence on the effectiveness of public sector training reports treatment effects without doing proper cost benefit studies, and so these evaluations overstate net benefits by not accounting for costs.

Heckman, LaLonde and Smith (1999) present a comprehensive survey of the economic return to public-sector training, so it is unnecessary to restate their evidence here. Martin and Grubb

and 65 who live in private residence.

⁵⁶As noted by Kaplow (1996), Sandmo (1998), and Bovenberg and Jacobs (2001), accounting for the perceived marginal social benefit of redistribution sometimes reduces the marginal welfare cost of funds below unity. The exact figure for this marginal cost is a matter of some controversy in the literature.

⁵⁷Seven years has been selected as the measure here because Couch (1992) shows that one intensive wage subsidy program has annual benefits of that duration. On the other hand, Ashenfelter (1978) estimated a 13 percent annual depreciation rate of the first round impact on earnings, which suggests that an assumption of no depreciation is grossly at odds with the evidence.

(2001) provide a useful summary of some general lessons from the empirical literature on job training. Public job training is a heterogeneous activity. It includes classroom education, make work, subsidized employment and job search. The rate of return to classroom training is sizeable (see Heckman, Hohmann, Khoo and Smith, 2000). The rates of return for other components of training, however, are generally lower, although subsidized work appears to have a large payoff. Even when an activity such as job search assistance is profitable, the scale of and gains from the activity are low. Based on the empirical record, one cannot expect substantial benefits from job training (see the evidence Heckman, LaLonde and Smith, 1999).

Like the heterogeneity found in studies of the earnings response to education, there is considerable evidence of heterogeneity in response to treatment in job training (Heckman, Smith and Clements, 1997). Treatment is found to be most effective for those at the high end of the wage distribution. It has no effect for those at the bottom. There are substantial gains to be realized from targeting treatment. The information required to do so effectively, however, is generally not available (see Heckman, Heinrich and Smith, 2002). The returns to job training for older workers and displaced workers are very low, a consistent finding of the literature on this subject that is also consistent with the general picture presented in figure 12A.

Scotland has been seemingly more successful at job training than England. However, the results mirror the outcomes in the US. McVicar *et al.* (2003) use age eligibility requirements to estimate the effect of the New Deal for Young People (NDYP) in Scotland. They find that NDYP increased outflows from long-term unemployment, but almost half of this outflow was not into employment, but into education and training. This achievement is hardly a success. Blundell *et al.* (2003) argues that the effect of NDYP for the UK as a whole is small: about 17,000 more employed per year, but the cost is small as well.

4.7.2 Summary of Training Impacts

A comparison of the job training programs discussed in this section suggests a few important lessons. First, you get what you pay for. The recently terminated American JTPA program cost very little but produced very few results. An exception to the rule is the return to classroom training, which is substantial (Heckman and Lochner, 2000). Second, the effects of treatment vary substantially among subgroups (Heckman, LaLonde, and Smith, 1999). Third, job training programs also have effects on behavior beyond schooling and work that should be considered in evaluating their full effects. Reductions in crime may be an important impact of programs targeted at male youth. The evidence summarized in Heckman, LaLonde and Smith (1999) indicates that the rate of return to most US and European training programs is close to zero, although the benefits to certain groups may be substantial, and some may pass cost-benefit tests. We cannot look to public job training to remedy or alleviate substantially skill deficits that arise at early ages. They have also proven to be ineffective in equipping middle age workers for the modern economy. We next consider tax policy.

4.8 Tax and Subsidy Policy

Progressive income taxes of the sort in place in the United Kingdom retard skill formation. In addition generous social welfare payments of the sort recently implemented in the UK discourage work and hence investment in workplace based skills. Tax rules in the United Kingdom tend to promote human capital formation over physical capital formation. UK tax rules tend to encourage

investments made on the job over investments in formal schooling, especially schooling that requires substantial out-of-pocket or tuition costs. Although many of the effects of the current tax system on human capital investment may be unintended, they may nevertheless be substantial and may favor certain workers as well as certain types of investment over others. Based on studies for the US, we find that tax reforms are unlikely to have substantial effects on skill formation.

To understand how taxes influence human capital investment, it is helpful to understand the costs of and returns to such investment. The costs of investment in human capital are foregone earnings net of taxes plus any additional tuition or out-of-pocket expenses. Higher proportional taxes reduce the costs of spending an hour in school by the amount they reduce the return of working an hour in the market.

The simplest case to consider is a regime with flat (proportional) taxes in which the only human capital investment cost is foregone income. In this case, changes in the level of the flat wage tax will have no effect on human capital accumulation, because increases in the tax rate reduce the return by the same proportion as they reduce the cost. On the other hand, if there are tuition expenses that are not tax deductible, as they are not in the UK, a higher tax rate discourages investment in human capital, because it lowers the returns to investment more than the costs. In the case of a 10 percent increase in the tax rate, the return to investment decreases by 10 percent, and the cost of foregone income declines by 10 percent, but the tuition cost remains unchanged if tuition cannot be deducted from taxable income. Thus, the return to investment declines by more than the costs, so human capital investment is discouraged.

The current UK tax system, however, is not flat. The progressiveness in the tax schedule discourages human capital investment. The gain in earnings resulting from human capital investment causes some individuals to move up into a higher tax bracket. For such individuals, the returns from investment are taxed at a higher rate, but the cost is expensed at a lower rate. This discourages human capital accumulation.

Taxes on physical capital are another important component of the tax system that can affect human capital investment decisions. The level of human capital investment declines when the after-tax interest rate increases, because the discounted returns to investment are then lower. Reducing the tax on interest income can have a beneficial effect both on capital accumulation and on real wages. This illustrates the important point that the taxes on capital have real effects on human capital accumulation.

Heckman, Lochner and Taber (1998b, 2000) and Heckman (2001), estimate that for the US economy, a revenue-neutral move to a flat tax on consumption in the steady state would raise the wages of both skilled and unskilled workers and raise aggregate output by 5 percent (and aggregate consumption by 3.7 percent) while raising the wages of college graduates and high school graduates equally (7 percent). Such a move would barely affect overall inequality in earnings while promoting the accumulation of greater levels of both human capital and physical capital.⁵⁸ The major effect of such a reform, however, would be on physical capital and its feedback effects on wages through the increased productivity of labor. It would have only a small effect on human capital accumulation. Tilting the bias in the tax system toward capital and away from human capital would improve the

⁵⁸In order to account for the constancy of capital's share over time in the U.S. economy, they use a Cobb-Douglas (in capital) model, and hence assume no capital-skill complementarity. Although some others claim to find such complementarity, they are hard-pressed to explain the near constancy of the capital share over time. This absence of capital-skill complementarity is the reason for the absence of any substantial effects on earnings inequality from a revenue-neutral move to a consumption tax.

earnings of both capital and labor in the long run.⁵⁹

Reforms to tax policy on interest income are either ignored or misrepresented in popular discussions. Populists see such a move as favoring capital and hence rich people. They ignore the crucial point that higher levels of capital stocks raise the wages of all workers in a roughly uniform way.

4.9 The Problem of the Transition

Skill-biased technical change operates to make workers trained under old regimes obsolete at prevailing wages in new regimes. This phenomenon operates with a vengeance in transition economies in Eastern Europe and Latin America that have opened up markets and now trade at world prices. These factors are also operating in Scotland.

Younger workers trained under old technologies can, and have, adapted to new technologies through retraining and education. For older workers, with more limited horizons of working life and lower levels of skill and ability, such reeducation is rarely economically efficient. Displaced workers in their forties who are offered generous retraining subsidies frequently refuse them, and the return to such training is low (see Heckman, LaLonde and Smith, 1999 for a summary of studies from around the world). Models of workers with heterogeneous ability and skill show that skill-biased technical change creates cohorts of workers with low earning power in the post-change economy (Heckman, Lochner and Taber 1998b). Their children adapt to the new economy through investments in human capital.

In the long run, the economy adjusts to a new, higher level of skill requirements, but the long run can last thirty years or longer and the newly disadvantaged workers created by a regime of technical change pose serious social and economic problems. Investment in them is often not economically efficient. Based on the best available evidence, the most economically justified strategy for improving the incomes of low-ability, low-skill adults is to invest more in the highly skilled, tax them, and then redistribute the tax revenues to the poor. Some would argue that the Blair government has done just this in creating incentives not to work by raising transfer benefits.

Many people view the work ethic as a basic value and would argue that cultivating a large class of transfer recipients breeds a culture of poverty and helplessness. If value is placed on work as an act of individual dignity, because of general benefits to families, and especially the early environments of young children and because of benefits to communities and society as a whole, then society may be prepared to subsidize inefficient jobs. Increased subsidies to employment induce people to switch out of criminal activities (Lochner, 1999). Subsidies induce labor supply and output that partially offsets the cost of the subsidy, and so they are a cheaper alternative than welfare (Phelps, 1997). The problem with giving such subsidies to adults is that they may discourage skill formation among the young if the subsidies are extended to them (see Heckman, Lochner and Cossa, 2003). To alleviate these adverse incentive effects, wage subsidies should be given on a cohort-specific basis.

Current thinking does not recognize the need to distinguish policies for different cohorts. Subsidizing work through the EITC (US) or WFTC (UK) can reduce the incentives to acquire skills and so perpetuate poverty across generations. Raising earnings today makes it more expensive to forego current earnings to improve one's future skills. This effect is strengthened by progression in the

⁵⁹Low-ability and unskilled members of the current generation do not benefit from a switch to a flat tax. Most ability types would benefit from a flat consumption tax. Heckman (2001) shows that both types of reform are more popular in a period of skill-biased technical change, because tax reform facilitates transition to the new, higher skilled equilibrium.

British tax system. Even though a policy that subsidizes work only for the old is inequitable across generations, it is socially efficient because it encourages the young to acquire the skills needed in the modern workplace. The policy prescription based on a firm empirical literature is to invest in the young and subsidize the work of the old, and the less able, and not invest in them. A little intergenerational inequity in the short run can promote efficiency in the long run.

Open markets, with flexible wages, will permit wages to adjust so that unskilled workers can find employment. This is the policy Adam Smith envisioned for Scotland in 1776 and it remains valid today. Older workers whose skills have become obsolete can still be productive at the right price. The right price may be too low from the point of a socially acceptable living wage. The appropriate policies for them is to encourage them to work and to subsidize their employment. The right policy for their children is to give them skills to be productive in the new economy.

5 Summary

This paper presents a framework for thinking about human capital policy in Scotland. It stresses the need to recognize the dynamic nature of the human capital accumulation process and the multiplicity of actors and institutions that determine human capital investments. Good policy recognizes heterogeneity in skills and human ability in designing policies to foster skill. It stresses the need to conduct cost-benefit analyses to rank proposed policies rigorously.

Because human capital is an investment good, it is important to account for the life cycle dynamics of learning and skill acquisition in devising effective human capital policies. Schooling is only one phase of a lifetime skill accumulation process. Families, firms, and schools all create human capital. Any comprehensive analysis of human capital policy must account for the full range of institutions that produce it.

Learning begets learning because of dynamic complementarities. The empirical evidence summarized in this paper points in this direction. Recent research has demonstrated the importance of the early years in creating the abilities and motivations that affect learning and foster productivity. Recent research has also demonstrated the importance of both cognitive and noncognitive skills in the workplace and in the skill acquisition process. Noncognitive skills are a form of human capital and can be produced. Some of the most effective interventions operate on noncognitive skills and motivations. Evidence from dysfunctional families reveals the value of healthy ones.

We have demonstrated the first-order importance of abilities and motivation in producing skills. Cognitive and noncognitive deficits emerge early, before schooling, and if uncorrected, create low-skilled adults. A greater emphasis needs to be placed on family policy. Studies of a limited set of small-scale, high-quality interventions reveal that early cognitive and noncognitive deficits can be partially remedied.

The traditional approach to skill formation policy focuses on schools. But families are just as important as, if not more important than, schools in producing human capital. The evidence from failed families points to possible benefits from interventions in them. This raises a new set of questions about whether or not society should respect the sanctity of the family in regard to certain dysfunctional groups.

Schools matter. The evidence shows that teachers matter, but that it is difficult to use conventional measures of teacher quality to assess who is a good teacher. Principals and parents know this. Schemes to improve productivity in schools should allow agents to use their local knowledge

to create the right incentives. Movement toward choice, competition and local incentives will likely foster productivity in the classroom.

The evidence also shows that education policies based on objective quality measures (class size, teacher salaries, and the like) that receive most of the attention in public policy debates are unlikely to produce dramatic gains in Scottish educational achievement. At current levels of educational support, marginal changes in conventional quality measures yield only modest benefits and often fail a cost-benefit test.

Much of the evidence that is alleged to support the existence of widespread credit market problems in the financing of college education is found upon examination to be weak. At the same time, there appears to be a small group of secondary school graduates (about 8 percent) who are constrained and for whom a targeted transfer policy may be effective. Untargeted programs can generate deadweight losses.

Scotland should seriously consider devising a more selective tuition policy by charging those who benefit most and providing relief for the small minority of bright, but poor children. This is one way to raise revenue and promote equality in the society at large. Persons who benefit from education should pay for it. College is not for everyone and policies that charge persons for the benefits that they receive will raise money for further skill investment and will help ration scarce resources. Scholarships to a small group of bright but poor children are justified on cost benefit grounds.

Targeting the persons who can benefit from interventions will improve the efficiency of the interventions. The trick is in identifying the groups for whom the interventions are likely to be effective. In many human capital programs this has proved to be an elusive goal.

The recent literature stresses the need to carefully assess the full life cycle stream of the costs and benefits of human capital interventions. Tax policy is unlikely to be a strong lever to pull to foster human capital development. At the same time, effective tax policy that fosters capital accumulation can have a substantial beneficial effect on wages.

We have stressed carefully the need to develop cohort-specific strategies. Middle-age workers whose skills have become obsolete make poor investments. The young and the more able make good investments. A better policy for the older displaced workers is to subsidize their employment and to make markets flexible. Younger workers should be trained with skills to enhance their productivity. Subsidizing the young directly will discourage skill formation and perpetuate poverty across the generations.

We have not discussed immigration policy in this essay. One way for Scotland to build the skills of its work force is to provide bounties for skilled labor to work in Scotland. Given that in a competitive market persons largely harvest the benefits they confer, it is far from clear that a national policy to attract skilled immigrants is desirable. There is little scope for policy interventions of this type. Flexible labor markets and incentives for excellence will attract top flight persons trained elsewhere to come to Scotland. They will also retain top flight Scots to stay, and promote a culture of excellence in the nation.

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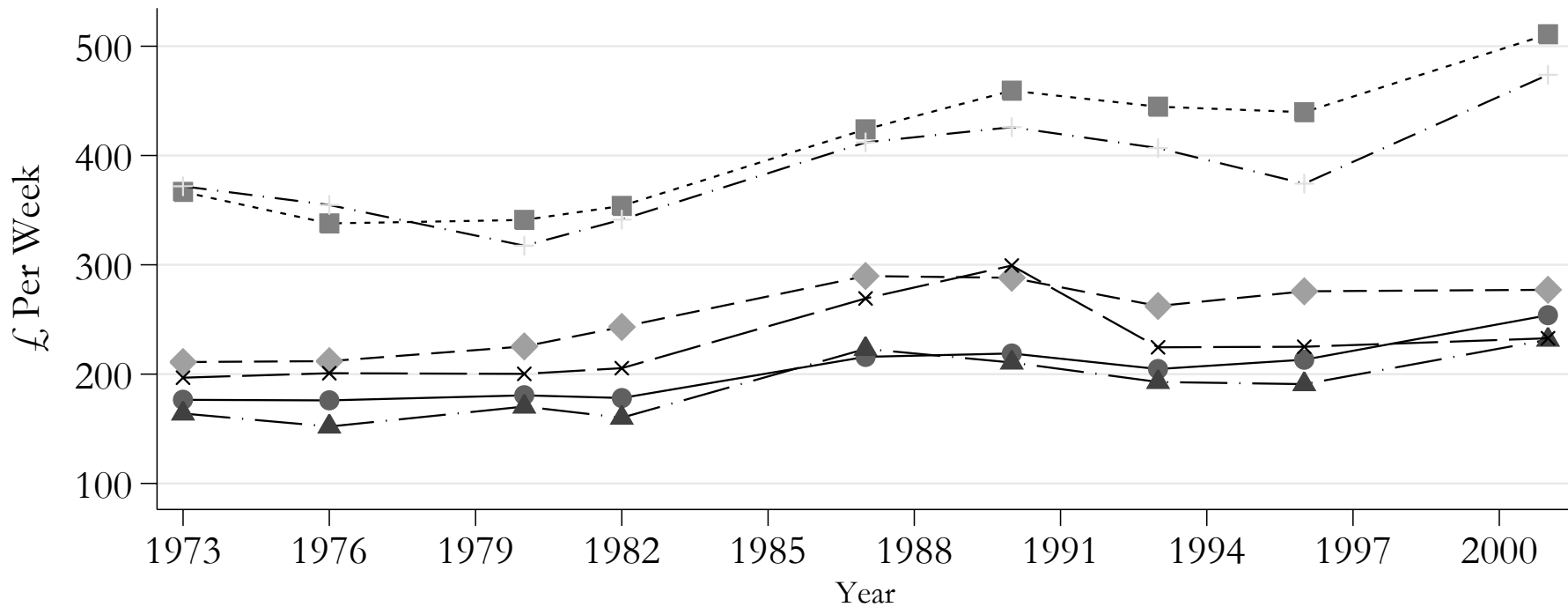
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Figure 1
Average Weekly Gross Wages by Highest Educational Qualification
Males and Females from GHS



English O Level	English A Level	English Degree
Scottish O Grade	Scottish Highers	Scottish Degree

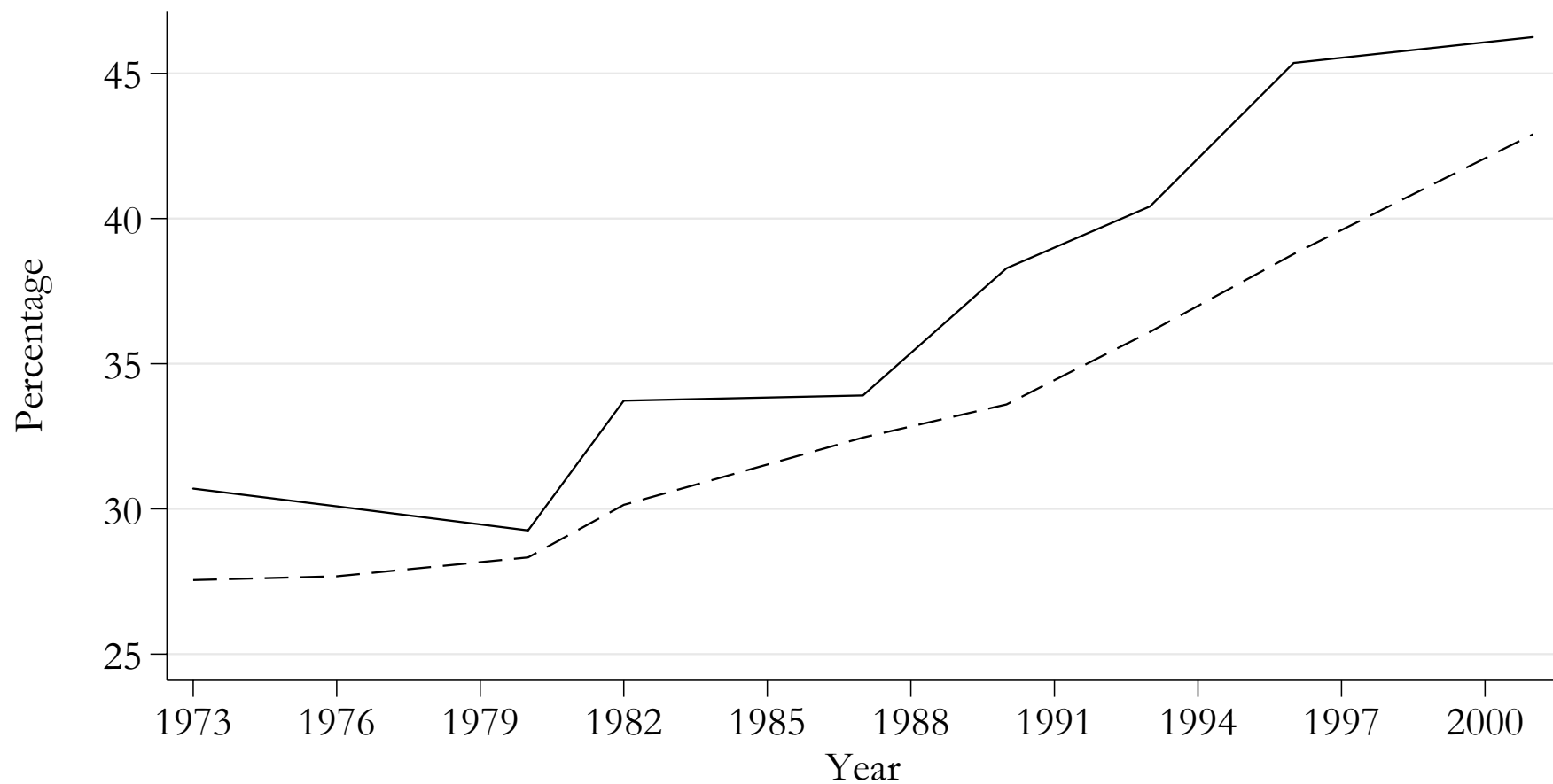
Note: Wages are shown in 2 year averages and are expressed in £1995. O Levels category contains those with NVQ level 2 or equivalent; GNVQ intermediate; RSA diploma; City and Guilds craft; BTEC/SCOTVEC first or general diploma; O level, GCSE grade A-C or equivalent qualifications. A Levels category contains those with NVQ level 3; GNVQ advanced; A level or equivalent; RSA advanced diploma or certificate; OND/ONC, BTEC/SCOTVEC national; City and Guilds advanced craft; Scottish 6th year certificate (CSYS); SCE higher or equivalent; AS level or equivalent and trade apprenticeship certifications. Degree category contains those who have a higher degree; NVQ level 5; first degree, or other degree qualifications.

Figure 2A
Employment Rate For Those With Low or No Qualifications
Males and Females from GHS



Source: Data for men and women ages 16–24.

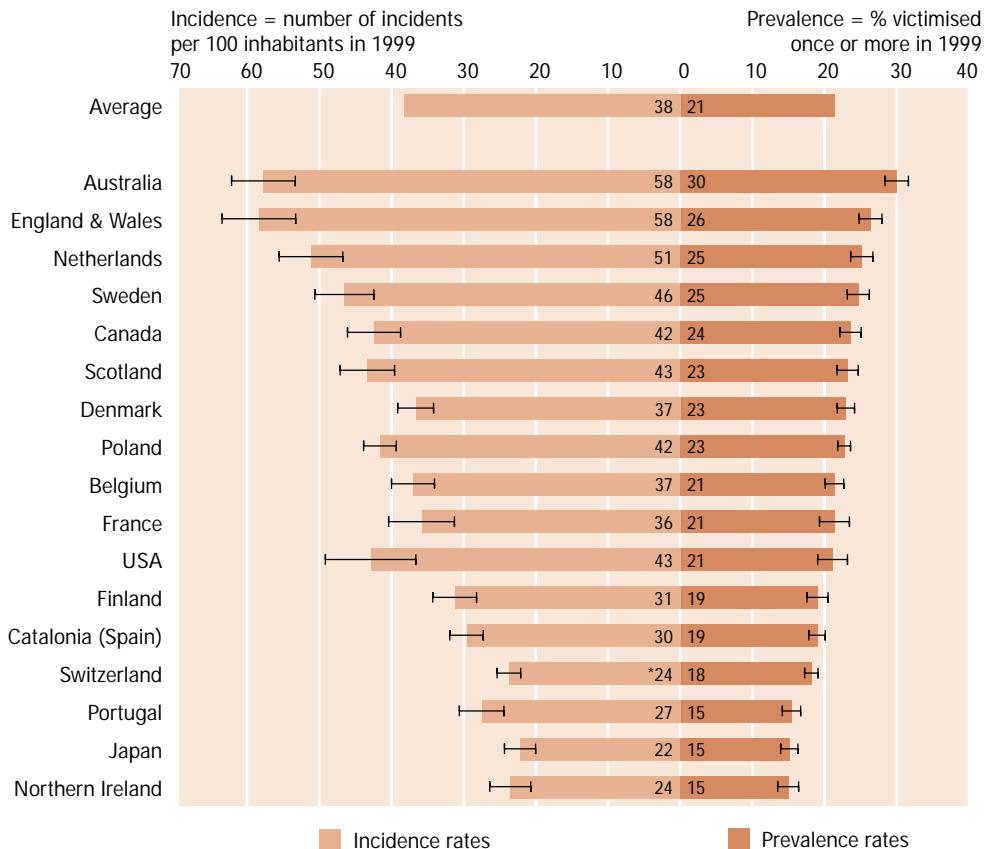
Figure 2B
Labor Force Attrition Rate Rate For Those With Low or No Qualifications
Males and Females from GHS



— Scotland - - - - England

Source: Data for men and women ages 16–24.

Figure 3. Overall Victimization

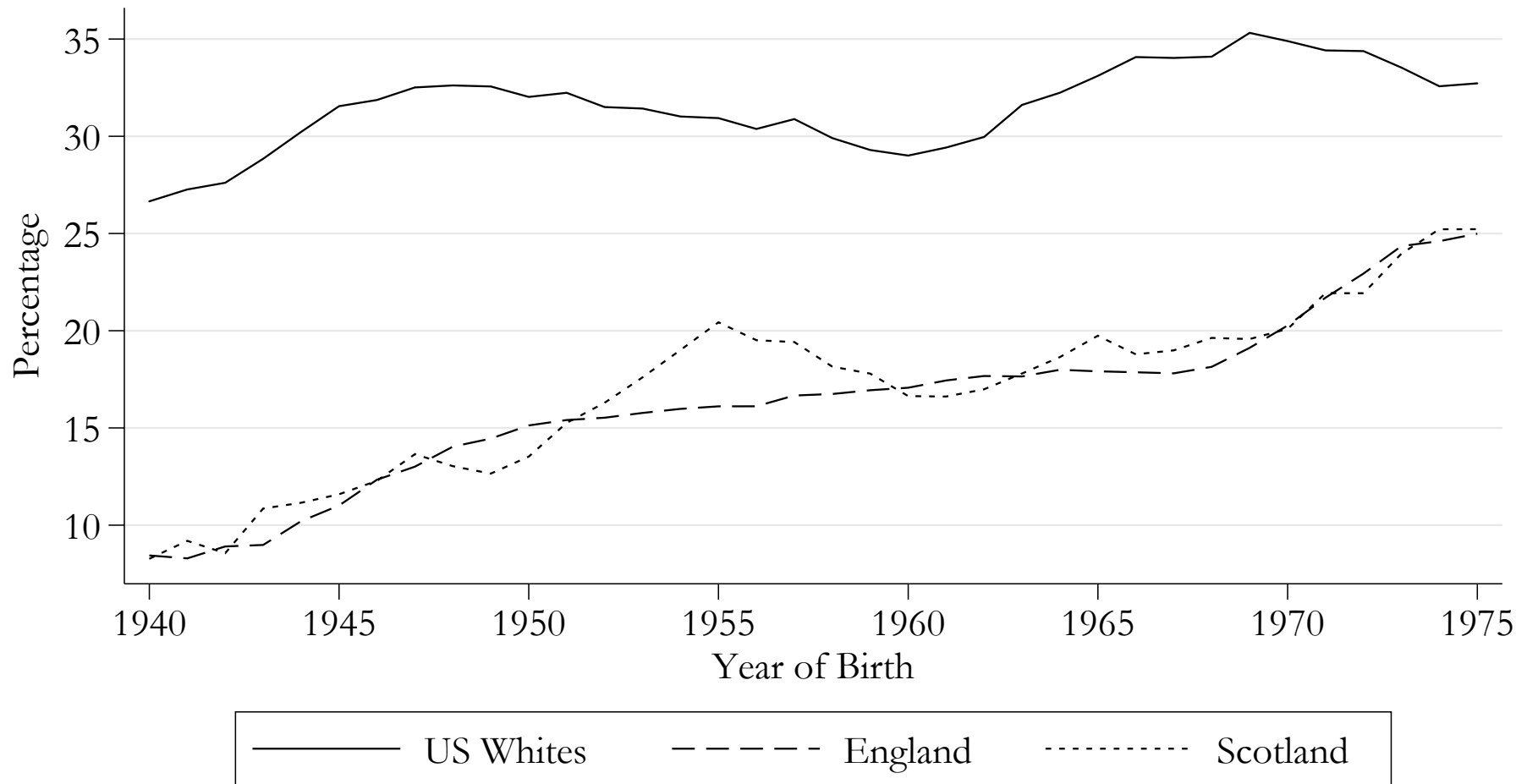


Countries are sorted by prevalence rates.

* Incidence rates for Switzerland are estimated.

Source: van Kesteren et al. (2001)

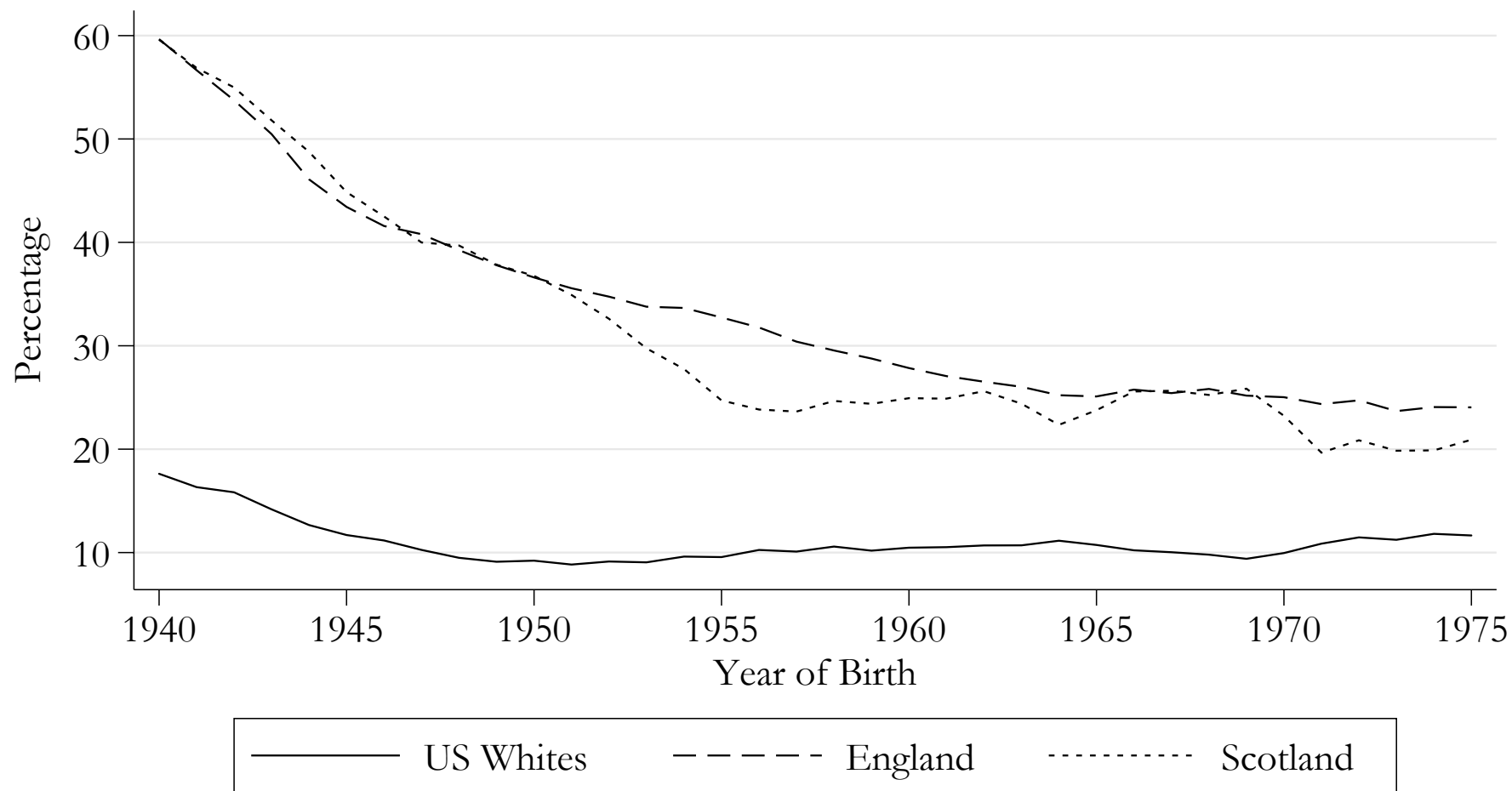
Figure 4
 Percentage of Residents With At Least a College Degree by Country and Year of Birth
 Data from QLFS 2002 and CPS 2000



Source: US sample contains only Whites. UK data is separated by place of residence, not by birth. The data is presented in 5 year moving averages. In the UK, the college category contains those who have a higher degree; NVQ level 5; first degree, or other degree qualifications. For the US, those with 4-year college, professional and terminal degrees are included.

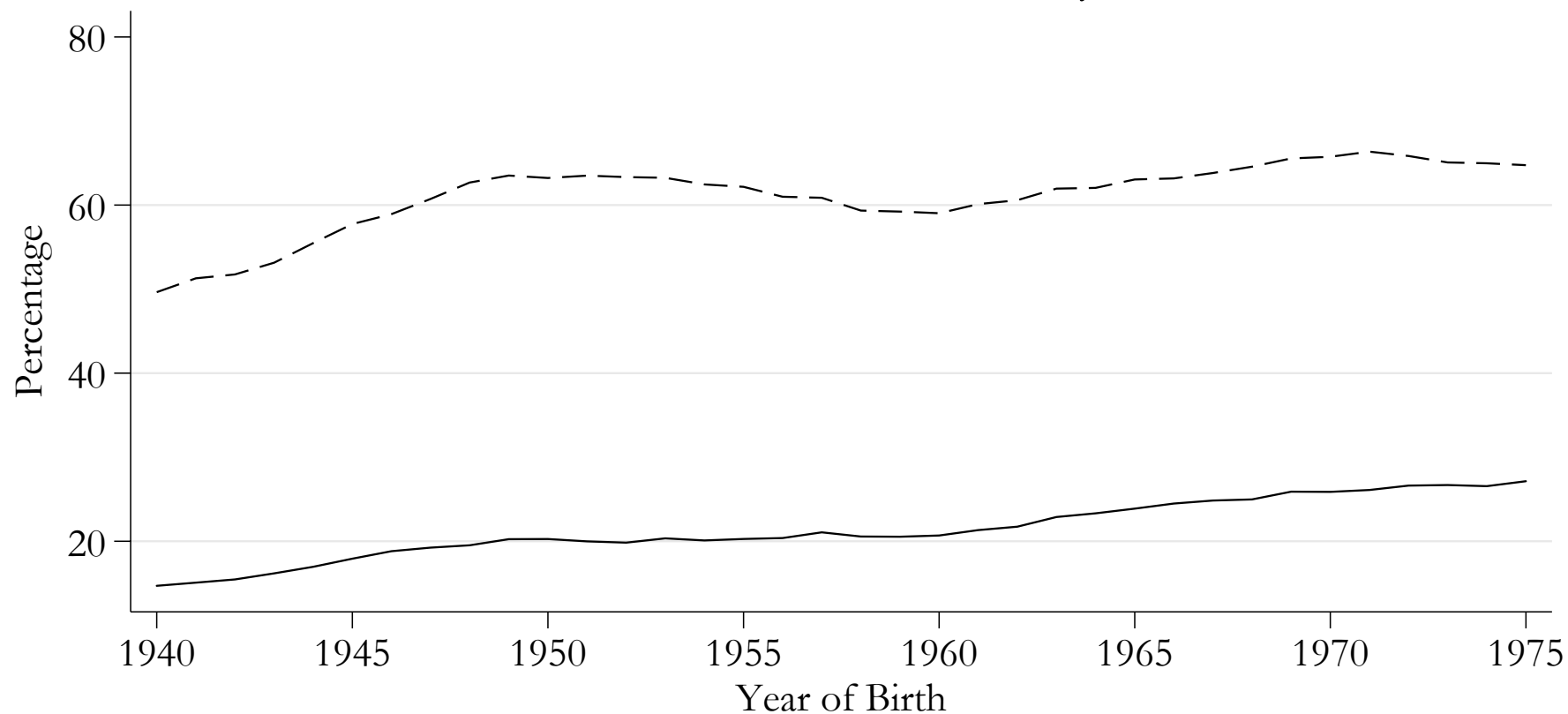
Figure 5

Percentage of Residents Who Have Low or No Qualifications by Country and Year of Birth
Data from QLFS 2002 and CPS 2000



Source: US sample contains only Whites. UK data is separated by place of residence, not by birth. The data is presented in 5 year moving averages. In England, dropouts are defined as those who lack college (or more), A or O level qualifications (or their equivalents). In the US, they are defined as ordinary dropouts and GED recipients.

Figure 6
Enrollment and Completion For College For US Residents by Year of Birth
Data CPS 2000, Whites Only



— US College Completion - - - - - US College Enrollment

Source: US sample contains only Whites and excludes those who are currently enrolled. Enrollment refers to participation in any type of post-secondary education, even if no degree was received. Completion refers to the attainment of a bachelor's degree. The data is presented in 5 year moving averages.

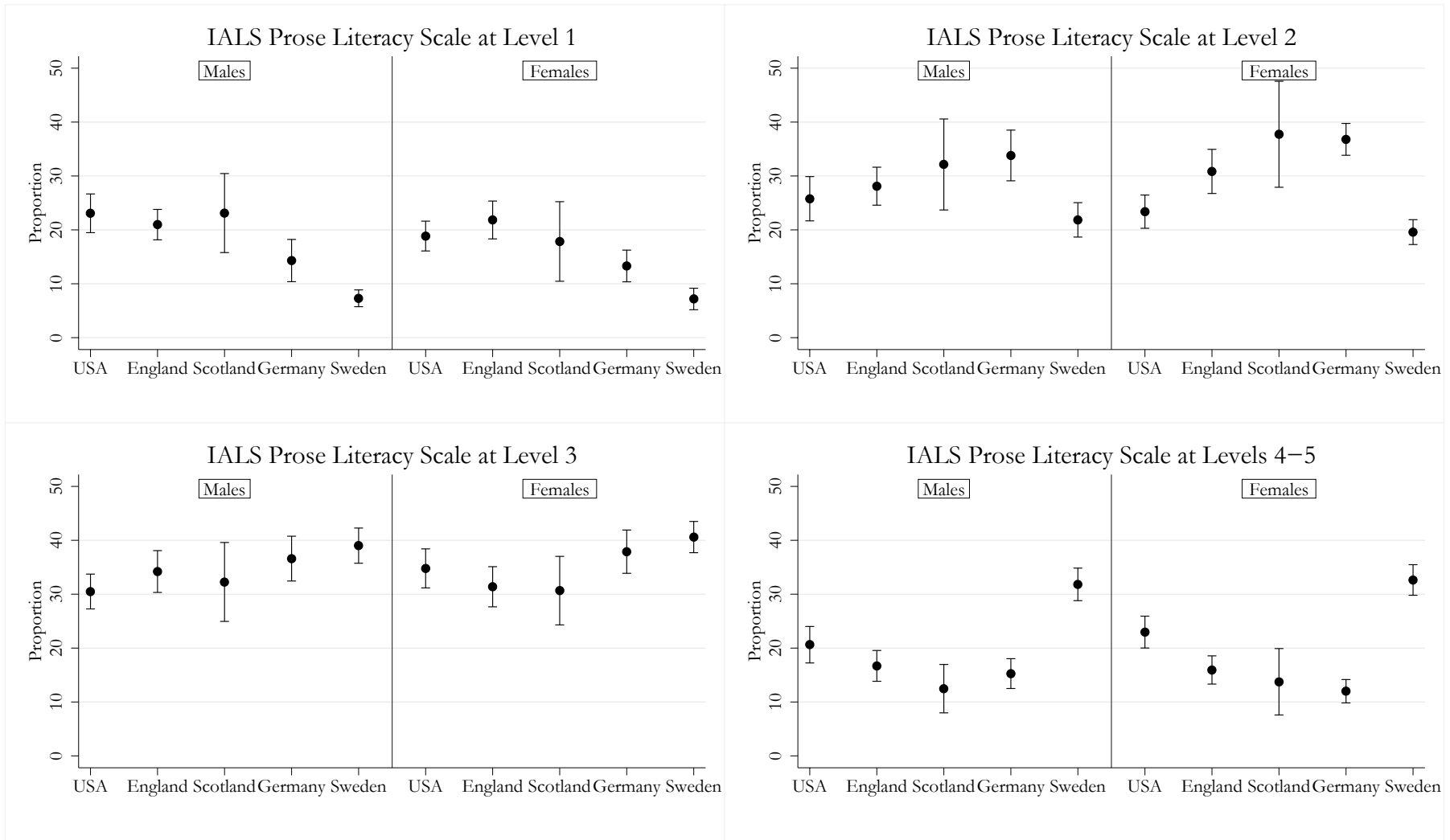
Figure 7
Age Participation Index for Scotland and England



Source: The API is the number of young (under 21) home initial entrants expressed as a percentage of the averaged 18 to 19 year old population.

Figure 8

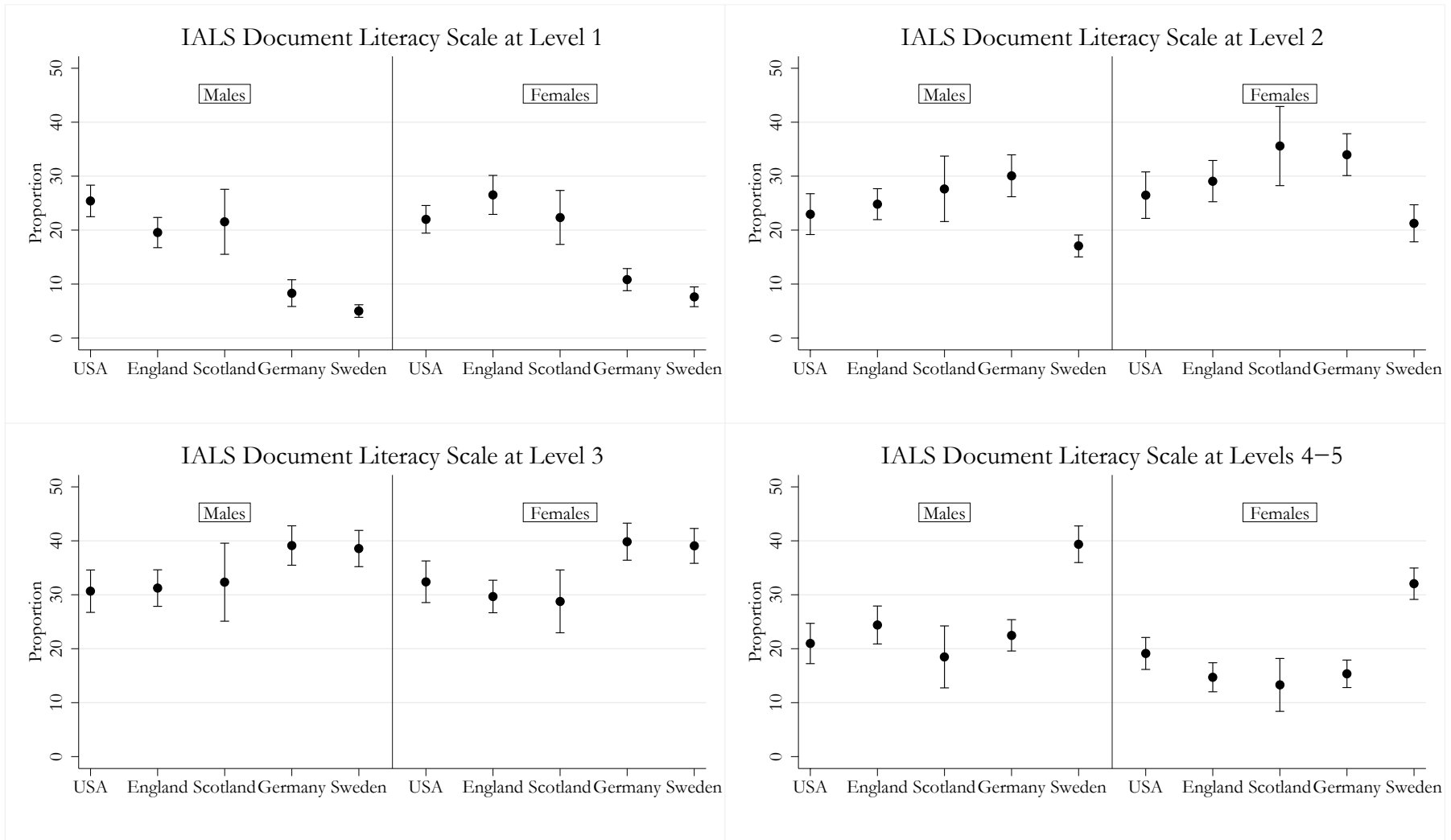
Proportion of Each Gender In a Given Level of IALS Prose Literacy Scale



The scale scores were grouped into five levels of increasing difficulty. Levels 4 and 5 were combined. The sample is restricted to adults who are between 16–65 years of age at the time of the survey (1994 for the US and Germany, 1996 for the UK, and 1994–1995 for Sweden). Standard errors are calculated using the methodology described in IALS (2002).

Figure 9

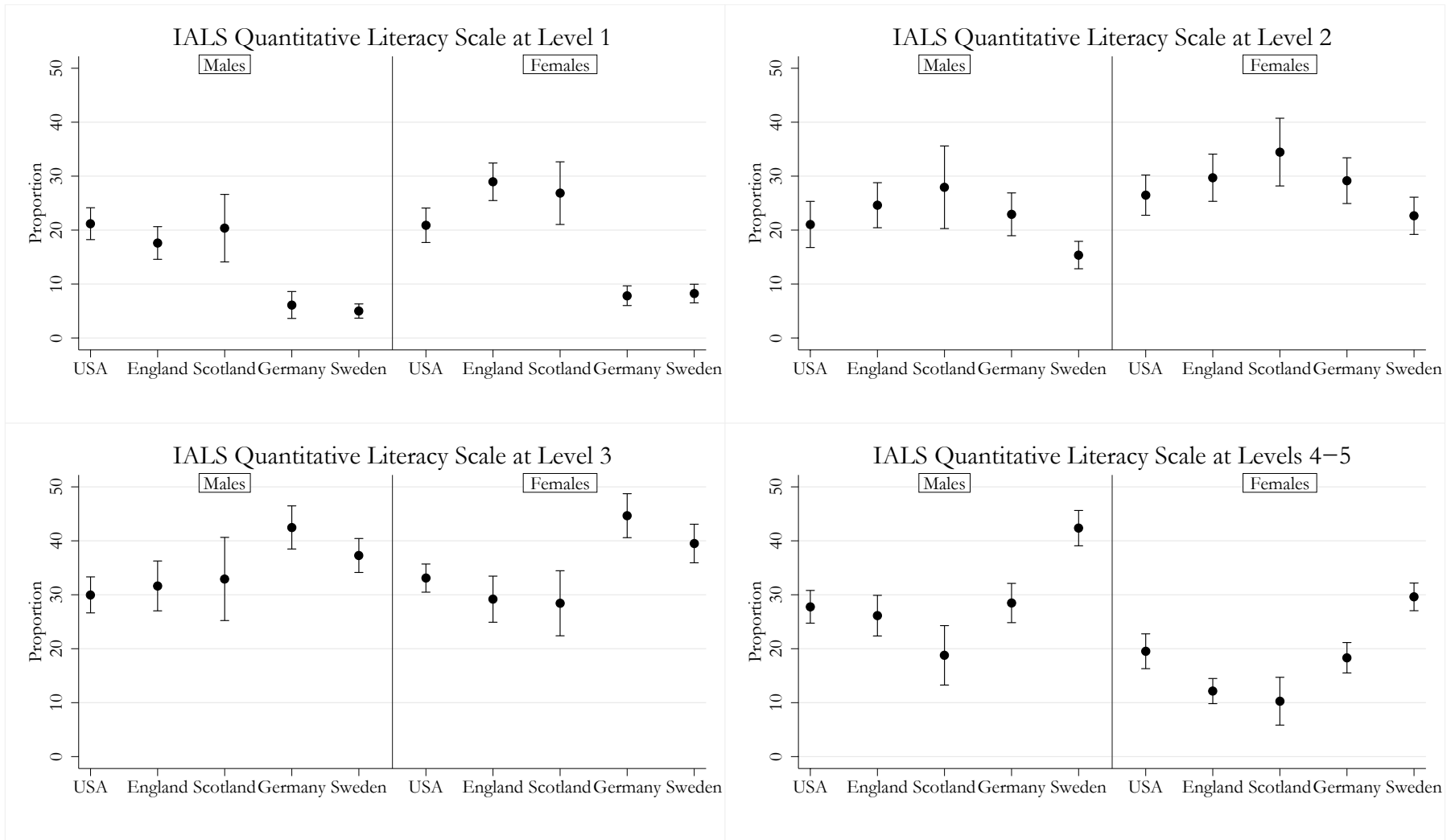
Proportion of Each Gender In a Given Level of IALS Document Literacy Scale



The scale scores were grouped into five levels of increasing difficulty. Levels 4 and 5 were combined. The sample is restricted to adults who are between 16–65 years of age at the time of the survey (1994 for the US and Germany, 1996 for the UK, and 1994–1995 for Sweden). Standard errors are calculated using the methodology described in IALS (2002).

Figure 10

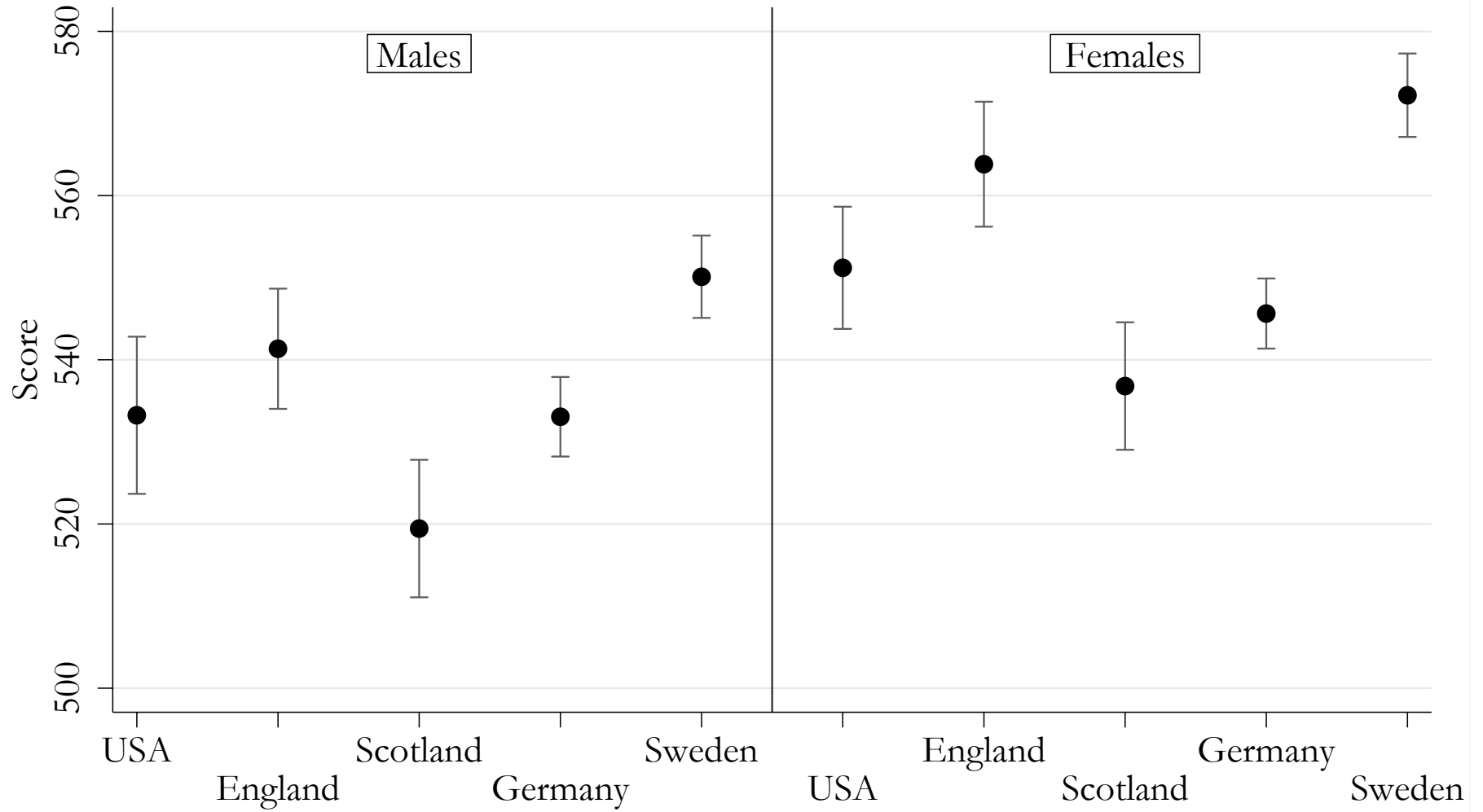
Proportion of Each Gender In a Given Level of IALS Quantitative Literacy Scale



The scale scores were grouped into five levels of increasing difficulty. Levels 4 and 5 were combined. The sample is restricted to adults who are between 16–65 years of age at the time of the survey (1994 for the US and Germany, 1996 for the UK, and 1994–1995 for Sweden). Standard errors are calculated using the methodology described in IALS (2002).

Figure 11

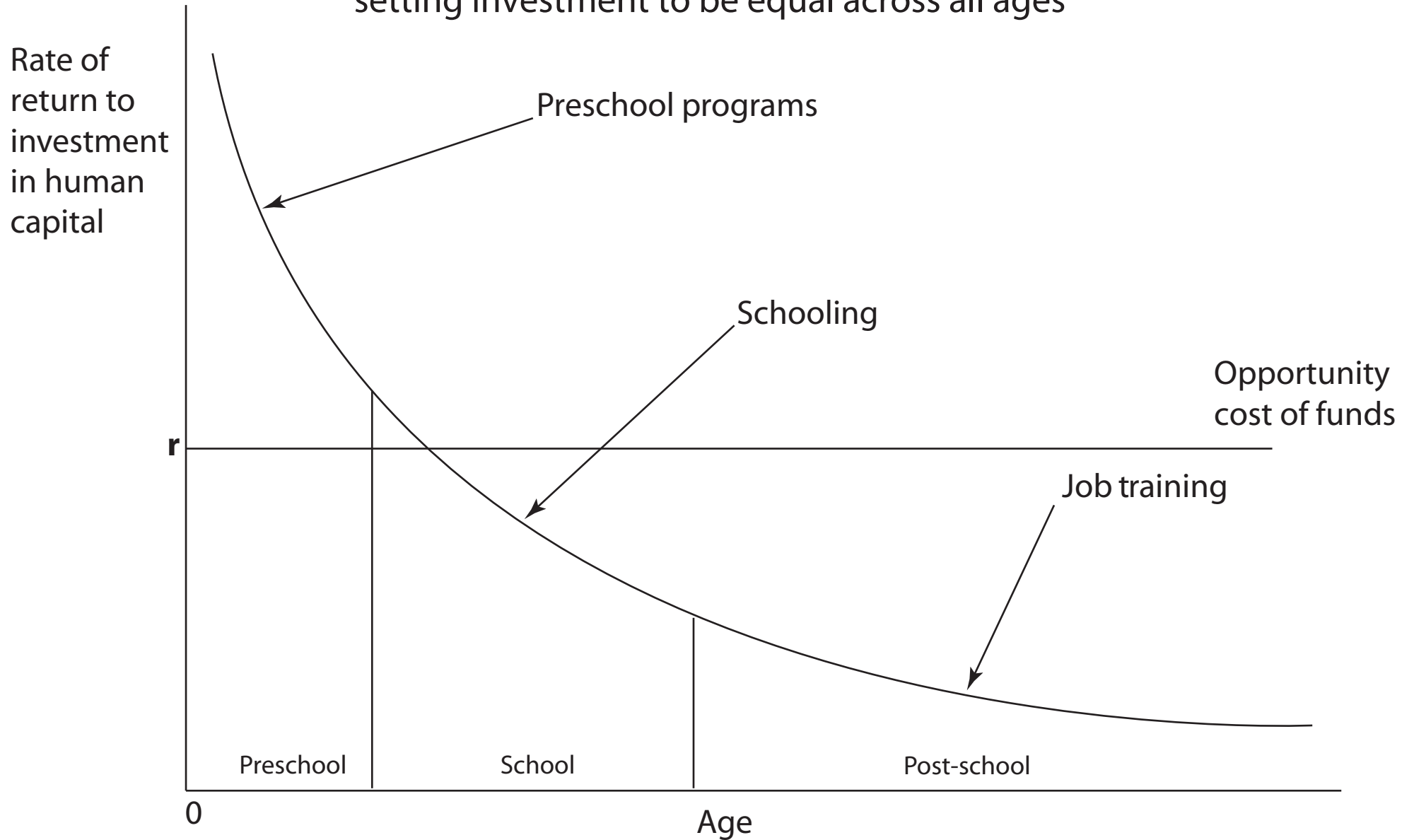
Overall Reading Score by Gender and Country



Source: Data is from the Progress In Reading Literacy Survey (PIRLS) of 4th graders conducted in 2001.

Figure 12A

(a) Rates of return to human capital investment initially setting investment to be equal across all ages



Rates of return to human capital investment initially setting investment to be equal across all ages

Figure 12B
(b) Optimal investment levels

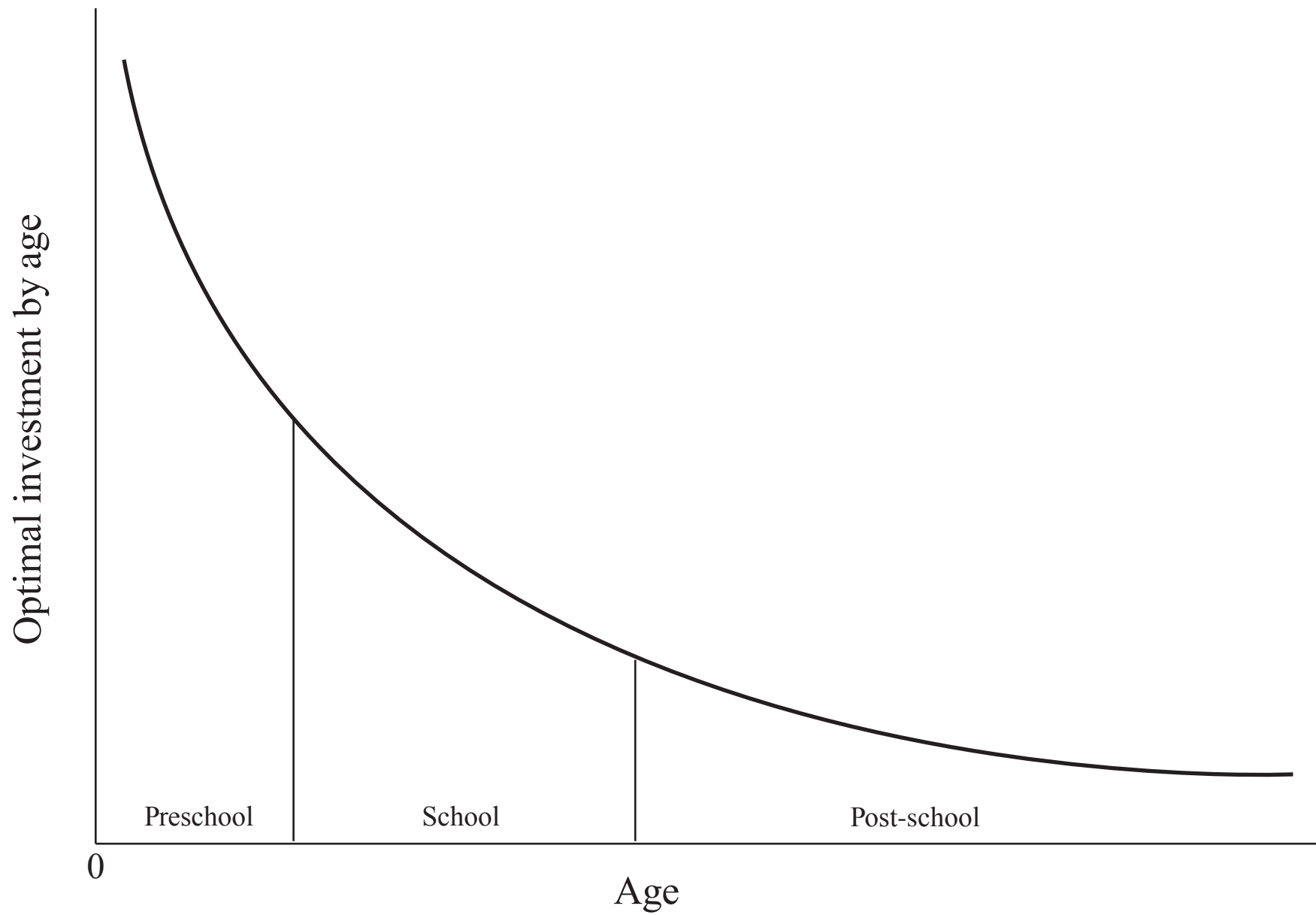
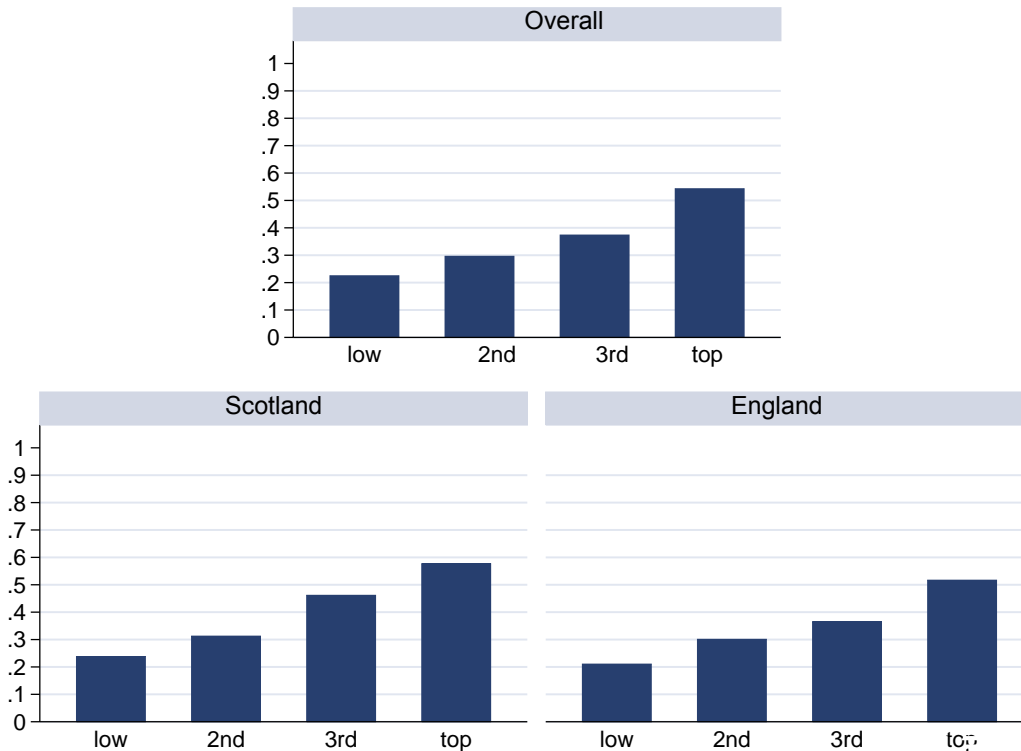


Figure 13A

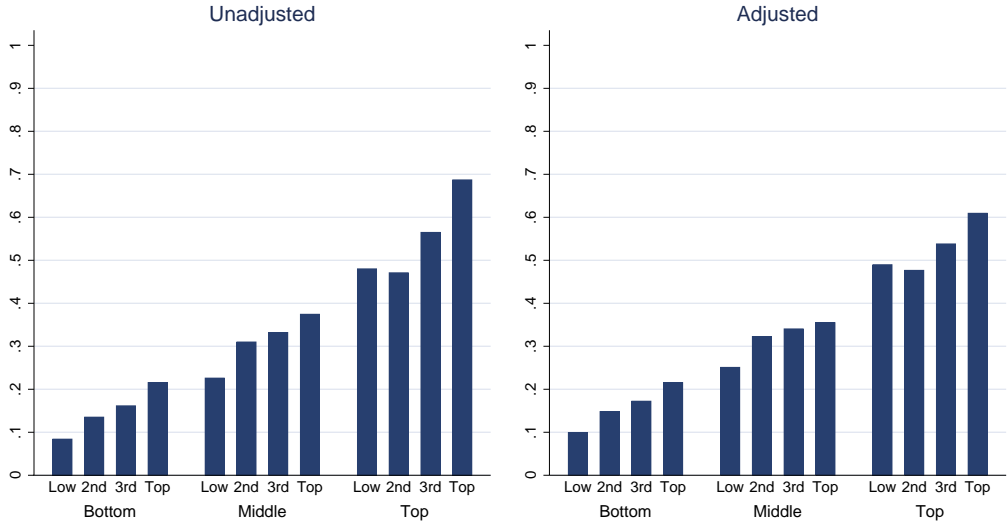
Higher Education by Family Income For England and Scotland Men and Women from BCS



Note: Higher education includes both vocational and academic degrees.

Figure 13B

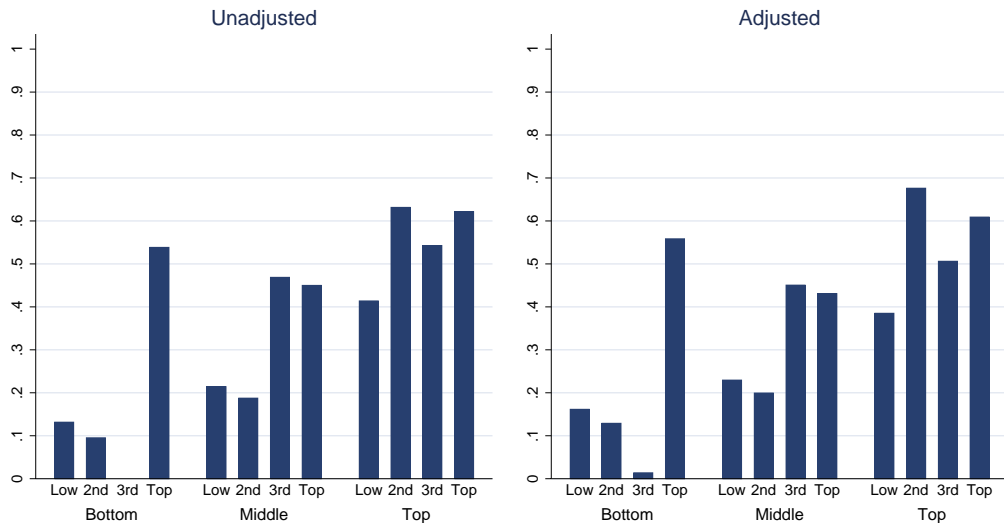
Higher Education by Family Income For England Men and Women from BCS



Note: Higher education includes both vocational and academic degrees. Adjusted by paternal education.

Figure 13C

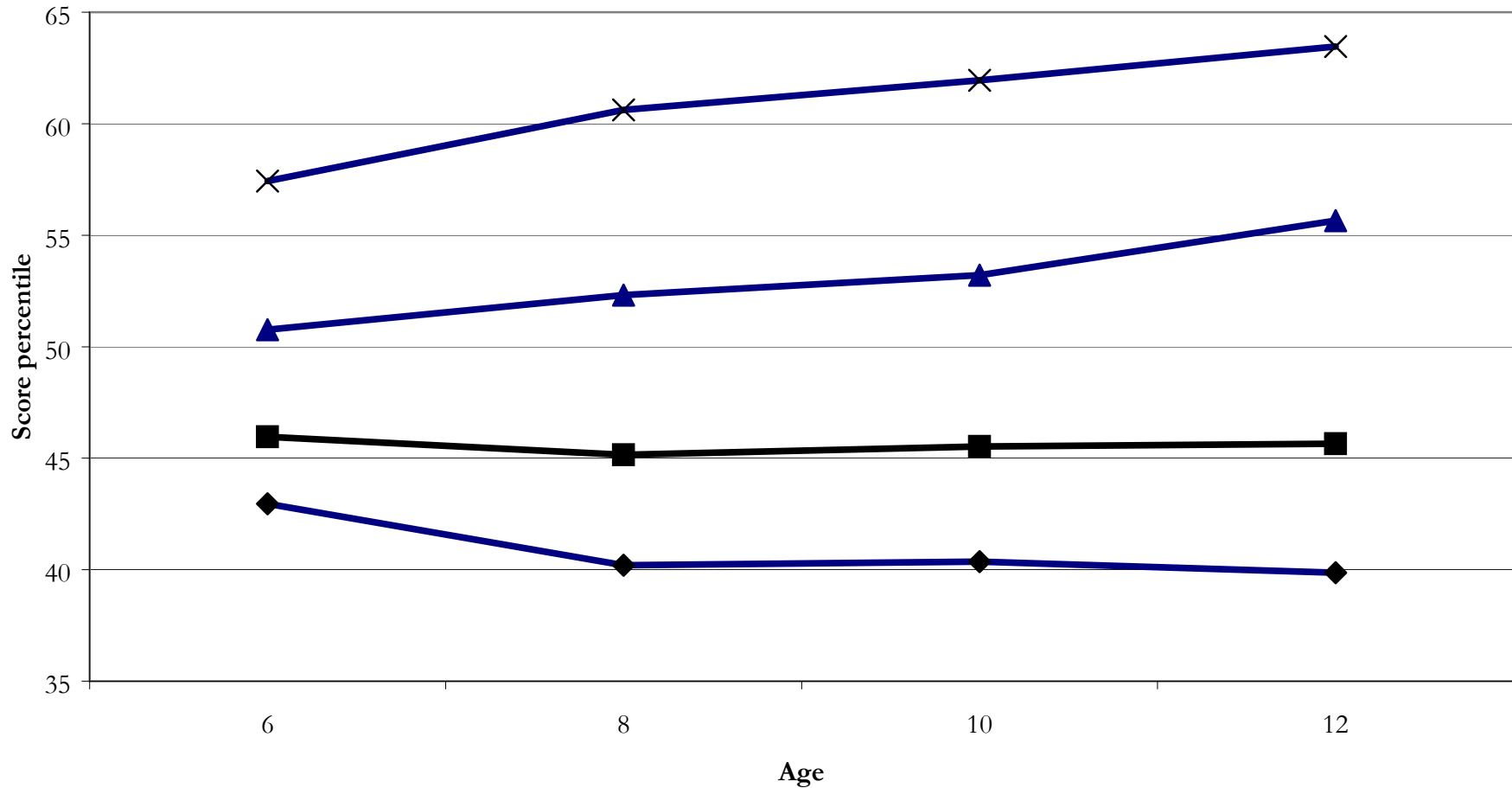
Higher Education by Family Income For Scotland Men and Women from BCS



Note: Higher education includes both vocational and academic degrees. Adjusted by paternal education.

Figure 14A

Average Percentile Rank on PIAT Math Score by Income Quartile*

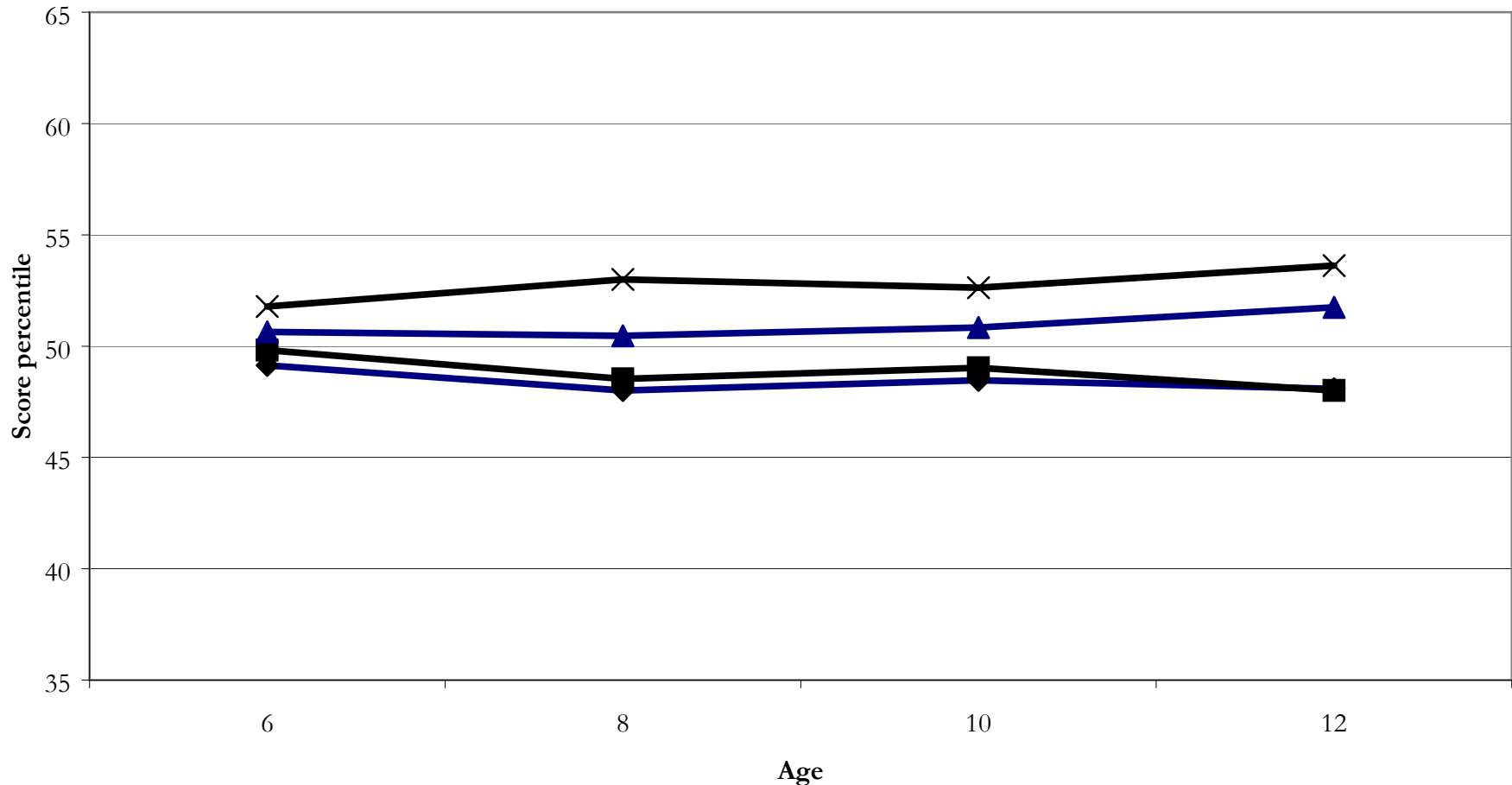


*The income measure we use is average family income between the ages of 6 and 10. Income quartiles are then computed from this measure of income

◆ Lowest income quartile ■ Second income quartile ▲ Third income quartile ✕ Highest income quartile

Figure 14B

Residualized Average PIAT Math Score Percentiles by Income Quartile*



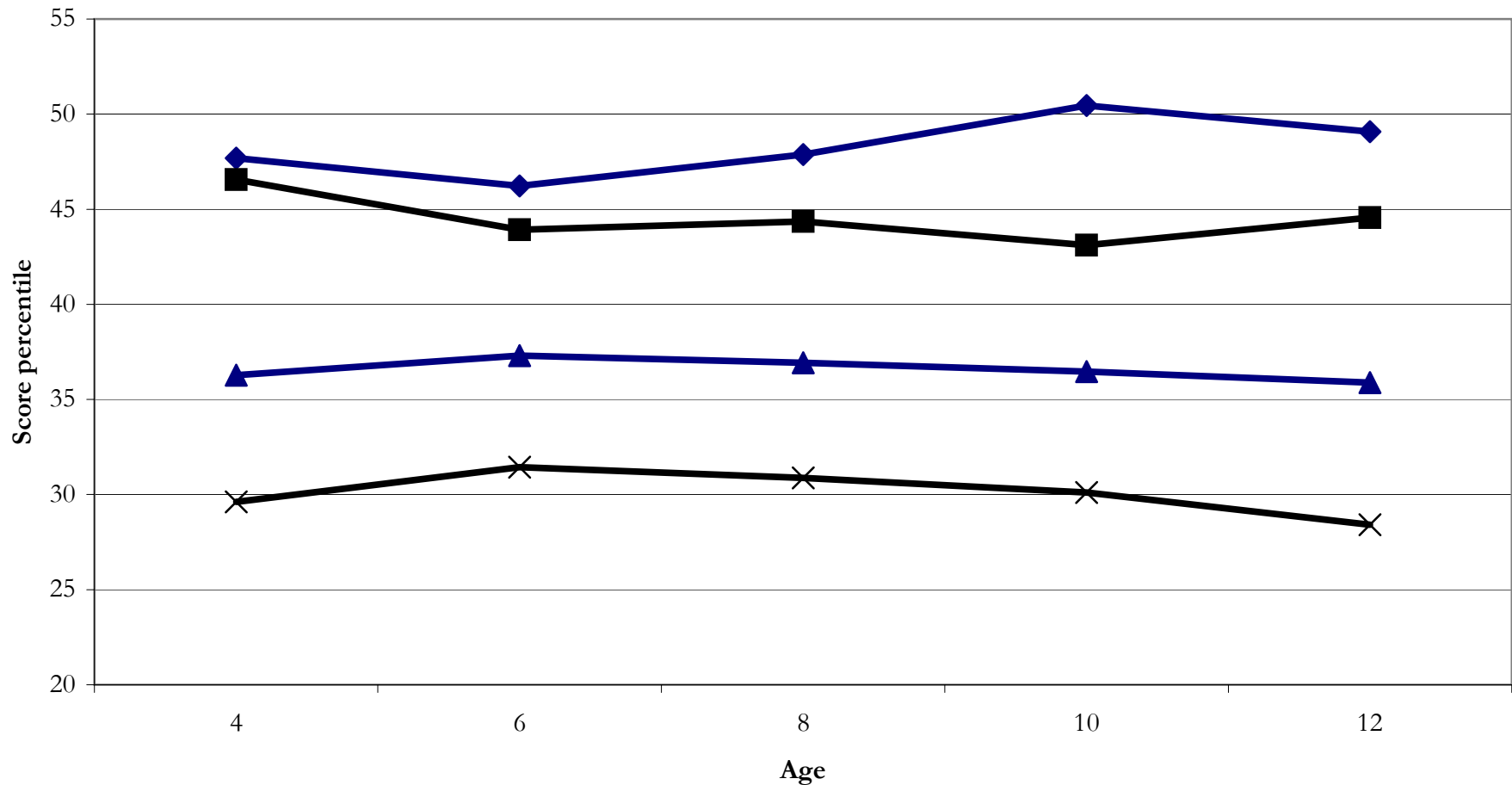
*Residualized on maternal education, maternal AFQT and broken home at each age (we use AFQT corrected for the effect of schooling).

◆ Lowest income quartile ■ Second income quartile ▲ Third income quartile ✕ Highest income quartile

Source: Carneiro and Heckman (2003).

Figure 15A

Average Percentile Rank on Anti-Social Score by Income Quartile*



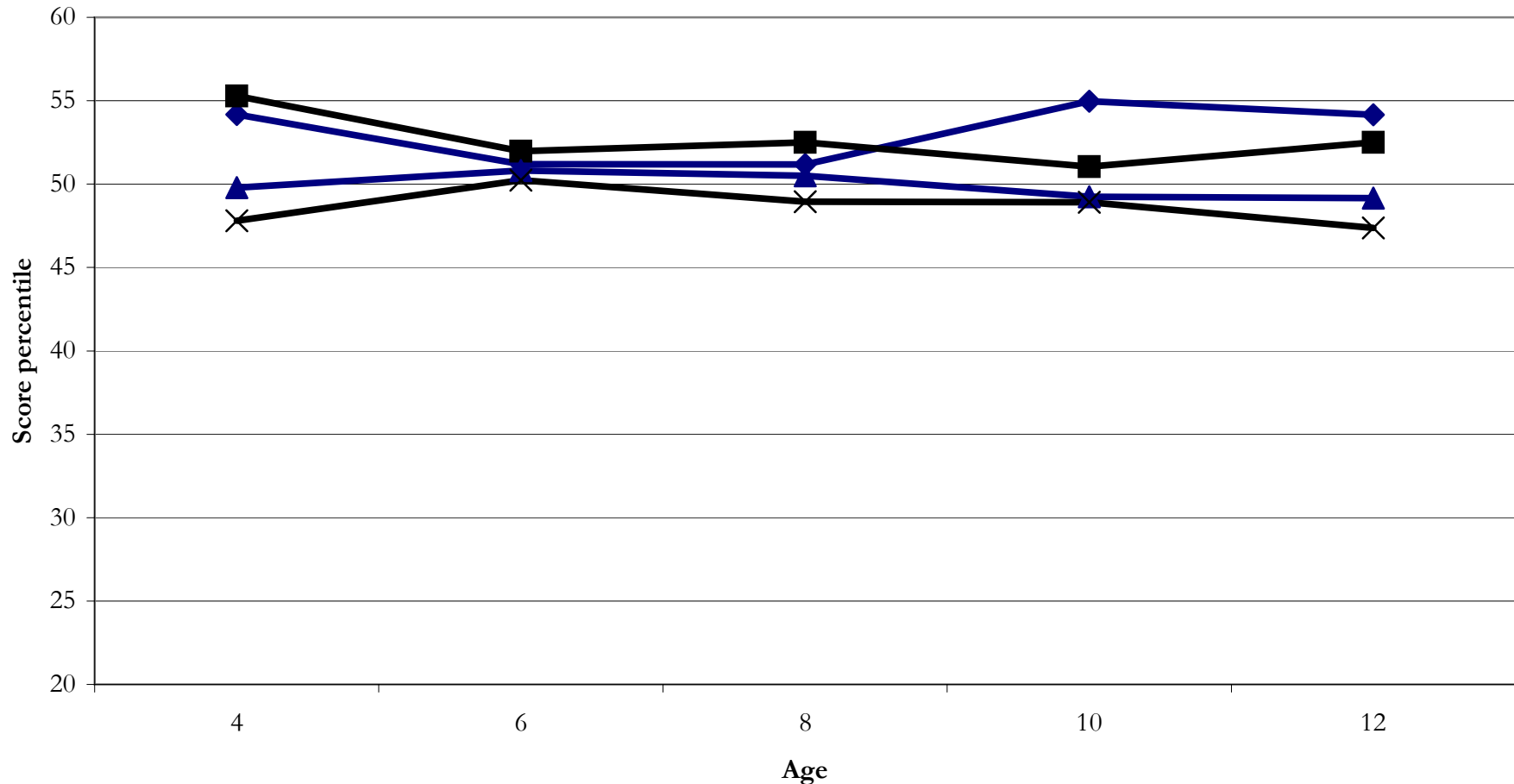
*The income measure we use is average family income between the ages of 6 and 10. Income quartiles are then computed from this measure of income

◆ Lowest income quartile ■ Second income quartile ▲ Third income quartile ✕ Highest income quartile

Source: Carneiro and Heckman (2003).

Figure 15B

Residualized Average Anti-Social Score Percentile by Income Quartile*



*Residualized on maternal education, maternal AFQT and broken home at each age (we use AFQT corrected for the effect of schooling).

◆ Lowest income quartile ■ Second income quartile ▲ Third income quartile ✕ Highest income quartile

Table 1
 Return to one year of college for individuals
 at different percentiles of the math test score distribution
 White males from High School and Beyond

	5%	25%	50%	75%	95%
Average return in the population	0.1121 (0.0400)	0.1374 (0.0328)	0.1606 (0.0357)	0.1831 (0.0458)	0.2101 (0.0622)
Return for those who attend college	0.1640 (0.0503)	0.1893 (0.0582)	0.2125 (0.0676)	0.2350 (0.0801)	0.2621 (0.0962)
Return for those who do not attend college	0.0702 (0.0536)	0.0954 (0.0385)	0.1187 (0.0298)	0.1411 (0.0305)	0.1682 (0.0425)
Return for those at the margin	0.1203 (0.0364)	0.1456 (0.0300)	0.1689 (0.0345)	0.1913 (0.0453)	0.2184 (0.0631)

Source: Carneiro and Heckman (2003).

Table 2

Perry Preschool: Net present values of costs and benefits through age 27

1. Cost of preschool for child, ages 3-4	12,148
2. Decrease in cost to government of K-12 special education courses for child, ages 5 to 18	6,365
3. Decrease in direct criminal justice system costs ^a of child's criminal activity, ages 15 to 28	7,378
4. Decrease in direct criminal justice system costs ^a of child's projected criminal activity, ages 29 to 44	2,817
5. Income from child's increased employment, ages 19 to 27	8,380
6. Projected income from child's increased employment, ages 28 to 65	7,565
7. Decrease in tangible losses to crime victims, ages 15 to 44	10,690
<hr/>	
Total benefits:	43,195
Total benefits excluding projections ^b	32,813
<hr/>	
Benefits minus costs	31,047
Benefits minus costs excluding projections ^b	20,665

Sources: Karoly et al. (1998) and Barnett (1993).

Notes: All values are net present values in 1996 dollars at age 0 calculated using a 4 percent discount rate.

^aDirect criminal justice system costs are the administrative costs of incarceration.

^bBenefits from projected decreased criminal activity (4) and projected income from increased employment (6) are excluded.